



Abstract book
12th BCSWomen Lovelace Colloquium
University of Salford, 17th April 2019

The students:

125 students submitted abstracts across our four categories, and over 110 of these made it to the Colloquium in Salford on the 17th to present their work in poster form.

This e-book contains the abstracts of all finalists. The work of students is at the heart of what we do at the BCSWomen Lovelace Colloquium - showcasing the ideas, plans and achievements of women starting out in their careers in tech. Every abstract here was written by a woman studying computing or a related subject in a UK University, and every year we are blown away by the breadth and the depth of the students' knowledge. And their energy. And their ambition.

We thank the students for submitting, for making posters based upon their abstracts, and for coming to the event to present their work.

Helen Miles (Chair)

Hannah Dee (Deputy chair)

The winners:

First year including Foundation year, sponsored by Google

First prize: "[Challenges Associated with Humanitarian Applications of Neural Machine Translation for Low-Resource Languages](#)" by Kate Bobyn of the University of Sheffield

Second prize: "[Quantum cryptography: will our data remain secure?](#)" by Molly Ives of the University of Bath

Second year contest (also open to students on their industrial year or on the 3rd year of a 4 year degree), sponsored by Amazon

First prize: "[What would Avengers be like with Mr Bean as Thor? – How can 'deepfakes' disrupt the film industry](#)" by Luou Wen of the University of Nottingham

Joint second place were "[Source identification of social media images using CNN](#)" by Anastasia Taylor of the University of Buckingham and "[High Altitude Computing](#)" by Bridget Meade of the University of Stirling

Final year contest, sponsored by JP Morgan

First place went to "[DNA heritage augmented reality visualisation to challenge the concept of race and identity](#)" by Rachele Cavina of Edinburgh Napier University

Second place went to "[Ada: natural language search to support applicants for the University of Bath](#)" by Emma James of the University of Bath

MSc Prize, sponsored by AND Digital

First place went to "[Nature Nurtures, Computing, and electronics, a tool to teach empathy and care for nature.](#)" by Mariam Aomar Perez of Sheffield Hallam University

Second place went to "[The dark patterns - how good design can become bad](#)" by Maria Radu of the University of Bath

People's' choice prize (voted by attendees) sponsored by STFC

First place went to an augmented reality poster called "[Blank Is The New Exciting](#)" by Kristen Rebello of Middlesex University London

Second place went to "[Code as Old as Time](#)" by Hannah Bellamy of Durham University

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FIRST YEAR STUDENTS

Music for the Masses: How machine learning is changing the music streaming industry

Alexandra Stanhope, *Lancaster University*

How do you find new music? Maybe you ask a friend who likes the same stuff as you, or you just listen to a radio station you like until you get lucky. Increasingly, those of us itching for a new discovery are turning to personalised, curated playlists made by streaming companies like Apple Music or Spotify. These services look at what you listen to often, and what people who listen to the same things also like in order to recommend similar music. This often leads to broadly popular big name artists becoming more popular, and smaller, niche artists sinking into obscurity. Is there a smarter way to do this? In 1999, the Music Genome Project started, with the aim to assign up to 450 specific attributes, such as pitch, key, instrumentation, and mood, to songs using the ears of trained musicians. This project led to the American company Pandora Radio being founded, with the specific goal of using machine learning to help users discover new music based on the attributes of songs they already love, rather than the opinion of those they've never met. This poster explores how Pandora Radio recommends music to users and whether its algorithms lead to an experience where users make new discoveries and small artists can find their voice in a very loud industry.

How the application of the Internet of Things in the homes of elderly people can assist and improve their healthcare.

Antonia Still, *Durham University*

The UN (2017) estimated the world's population of over sixties to be 962 million and the population of those over sixty to be growing at around three percent yearly. With the advancement of healthcare, people are living longer. Elderly people require careful monitoring because a minor injury can have detrimental effects. More elderly people needing to be cared for puts a financial strain on the national healthcare system. A potential solution to this issue is the Internet of things (IoT), which allows for discreet and adaptable devices. These devices can be useful in elderly healthcare, allowing the elderly to stay in their own home, whilst remaining safe and healthy. Research into how the IoT can be beneficial in the care of the elderly is significant because the IoT has the potential to monitor their physical and mental wellbeing, easing the pressure of the caregivers and ensuring the elderly receive the care they require. An Arduino with sensors will be used to code a thermostat system. The thermostat system could be helpful for elderly people living in their own home. The

thermostat can detect temperature, humidity and light. Through the IoT the conditions in the homes of elderly people will be adjusted automatically. This in turn could prevent further health problems, such as hypothermia and so less elderly are likely to get ill, allowing them to continue to live independently.

What will happen when AI becomes smarter than us?

Awen Rhys, *University of Bath*

With the potential for AI to surpass human intelligence looming closer and closer, we must consider what might happen when we get there. We have already succeeded in making AI which can outsmart humans in very specific areas; notably, the AlphaGo's success in beating world champion 'Go' players. While the gap between narrow AI and superintelligent AI is undeniably great, some expert predictions put it within our lifetime. There are many risks associated with AI being more intelligent than humans, as intelligence can enable control and power over others. Humans have power over other animals, such as dogs, as we can outsmart them. So, we must consider the potential of control that an AI would have if there were the same intelligence dynamics as we have with other animals. There is also a risk of misaligned goals, such as an AI deciding that the solution to stopping email viruses is to eradicate humans, as there would then be no emails, meaning there are no longer any email viruses. However, on the other hand, there is also the potential for superintelligent AI to find solutions to problems we've been unable to. This could include cures to diseases, reversing environmental damage, and fixing world poverty, potentially saving and improving billions of lives. This poster will explore all these possibilities and the merits behind them.

Why did we keep pushing forward?

Cheri Stevens, *University of Wolverhampton*

We walk around with computers more powerful in our pockets than we could perceive to be 20 years ago, we often do not look back into the past of our history and technological evolution. When looking at the first computers that were the size of a room and finding out that our modern day calculators are faster, cheaper and lighter than some of those room sized beasts we used to spend so much time and money on, it's hard to look back and visualise the hard work that went into the first modern day computers, in less than 100 years we have evolved from teams of people working on one machine to get it functioning to integrating them into every day lives and making their way into the mainframe of society. Game development came with a similar process of evolution. Before there were classes and teachers, people would sit up all night and day learning how to program a game and this drive and mentality that people had pushed the way forward into individuals leading to major start ups such as google and IBM, those few that really dedicated themselves before we had any form of convenience, without their knowledge they lead a path of inspiration that would change the world in so many unexpected ways. For all you know you could be the next person to lead the next inspirational wave for generations to come.

Challenging a "male-dominated" industry

Courtney Marsden, *De Montfort University*

Females in the computer science industry are a rarity, why? Statistics show that programming is a "male-dominated" industry; 37% of computer science students were women in 1984 which has now drastically dropped to approximately 18% in 2019. Only 1 in 4 computer science positions are assigned to women, suggesting that females are hugely underrepresented. However, women are slowly being introduced within computer science by the form of video games. A prime example of a character who breaks societies stereotypes is Faith Connors. Faith is the protagonist in the video game *Mirrors Edge* where she competes within another male-dominated industry, parkour. Furthermore, introducing more females into the video gaming industry can produce several negatives, such as sexualisation. The main victim of this would be proven to be Lara Croft as stated by Rhianna Pratchett, lead writer of *Rise of the Tomb Raider*: "A lot of the sexualization of Lara in the past has been solely for purposes of marketing, and it had a huge sway." She then continued to say "I was put off by that kind of marketing of Lara. It was very much like, 'Hey I'm being sexy for boys here.' I thought I'll and play another game, then." which explains the slight lack of female gamers at 42%, according to a mid-2015 survey reported by UKIE. On a positive note, for students like I, the few females whom are in the industry are considered as role models; which only fills me with motivation to join them.

Human Computer Interaction (HCI) - Impact on education for disabled learners

Deega Mohamud, *Middlesex University*

Given the restrictive nature of conventional teaching some individuals with disabilities are unable to reach their full potential. In order to combat this, special technology has been developed to aid people with these restrictions. Human computer interaction allows the technologies to be specialized and tailored to the user's education. For this to work, there needs to be an in-depth understanding of the user's needs is required. Assistive technology (AT) is any type of software, apparatus or system that allows users to demonstrate what they wish to convey which may otherwise prove difficult as a result of disability. There are software functions such as text-to-speech which helps people who are visually impaired or people who find it easier to listen as opposed to reading. There is also speech-to-text to enable people who have hearing difficulties. Although AT is beneficial for disabled learners, it could also be counterproductive. This is because without adequate training, the use of AT can hinder one's progress if it is used incorrectly. Further to this, the systems being used are not always reliable and if faulty, students are unable to successfully completing tasks at

hand. There are many technologies that help these disabled learners communicate with others in work and social situations. This allows them to learn and grow with more independence and in turn help build their confidence to ensure that they do not feel as though society is moving on without them. In this poster, I will investigate the technologies designed for assisting disabled learners in their education.

Affective Computing: The Marvellous and Alarming Implications of Emotionally Intelligent Machines

Emma Scott, *University of Greenwich*

Affective computing is a widely discussed topic that can evoke extreme opinions, ranging from the hope induced by its applications for making the world a better place, to the fear caused by the dangers and moral implications that could be a result of uncontrolled progress in this field. Due to the potential power that it could have, it is surprising to see that its applications to the real world remain limited. That is not to say great strides have not been made however, with computers now able to detect affect with up to 97% accuracy under certain conditions. This is already having an impact on key fields such as education and healthcare and this progress promises to continue in an exponential fashion. This piece not only explores the positive aspects that have already been developed but delves into why the limitations on the field exist and ultimately what remains to be focussed on if this area of study is to be developed further and we are to truly understand the marvellous and alarming implications of emotionally intelligent machines.

Sensors in Smart Cities

Jennifer Boyse, *University Of Bath*

In the constantly evolving technological landscape, we are increasingly encouraged to integrate data and technology into our daily lives. Recently, more and more computing devices are being incorporated into our environment, resulting in the Internet of Things (IoT). In allowing everyday objects to advance connectivity, IoT makes Smart Cities possible, giving rise to a multitude of benefits including enhanced efficiency, smarter energy usage and an improved quality of life for their residents. However, none of this could happen if sensors weren't used in the physical IoT devices. Already, a number of related projects are in operation globally, all striving to bring cities into the future. Cities such as Amsterdam and Barcelona have implemented strategies for a range of applications such as controlling traffic flows, irrigation and energy usage in buildings. In this poster, we explore this exciting area and how sensors are helping to make these cities smarter.

"Are we really alone?"

Katarzyna Romaniu, *Lancaster University*

It is hard to imagine that 50 years ago humankind landed on the moon with a computer with only 1.024 MHz of processing power, around 76kB of memory and weighing 30 kg. Some people compare it to a pocket calculator when it comes to capability. Can a calculator perform eight operations at the same time? Impressively, in 1969 the Apollo Guidance Computer could. Since then progress in space exploration and the computing to support it has really started to flourish. One of the most important reasons we explore outer space is that we seek other forms of life. If life on earth is possible, why would it not be the same for other planets? As Carl Sagan said, "The Universe is a pretty big place. If it's just us, seems like an awful waste of space." For me, I would like to gain insight into the potential for life beyond earth, how we explore the whole solar system, and what technology we leave behind. My poster will cover topics such as the mars rovers, Cassini spacecraft, landers and orbiters, as well as the women who contributed to the different space missions. It will present source code from devices used to explore our universe and will look at machines currently being developed for future space missions (e.g. Mars 2020).

Challenges Associated with Humanitarian Applications of Neural Machine Translation for Low-Resource Languages

Kate Bobyn, *University of Sheffield*

In an increasingly globalized world, cross-linguistic communication is critically important. Google Translate processes over 100 billion words daily, but it falls short in many cases, especially when grammatical incongruities between language pairs produce ambiguities and misinterpretations. Neural machine translation (NMT), a deep-learning-based approach, is emerging as the most promising paradigm. Through recurrent neural nets, convolutional neural nets, and self-attentional transformers, today's NMT systems perform quite well for most European languages. Modern NMT draws heavily on parallel corpora to "learn". This explains the disproportionate success rates of different languages. Languages like Finnish (spoken by 6 million people) are translated to and from English intelligibly via Google Translate, while Igbo, an African language spoken by 44 million, has remarkably poor performance. Bhojpuri, with 52.5 million speakers, is not even an option on Google Translate. This is particularly problematic for humanitarian applications. Natural language processing (NLP) is crucial for effective disaster relief operations in rural areas worldwide, and is increasingly relied upon by governments and aid organizations. With little possibility of predicting where the next crisis will arise, it becomes clear that the answer cannot lie in improved models for individual languages. We need general models that can "learn" a language quickly as needed. These models might draw upon knowledge from historical and comparative linguistics, using patterns in related languages to make inferences about the grammar and semantics of an unfamiliar language. DARPA's LORELEI initiative explores this. My poster will review some of the current research efforts in this area.

One Device Fits All

Kiranjit Kaur Shergill, *Coventry University*

The perception of technology differs from a range of generations. It is fairly common to see children of a young age exposed to the technological advancements in today's society. Hence why the younger generation tend to favour technology in their best interest such as aiding it for their education and social wellbeing. For the independent ratio of the country, they tend to utilise technology as an essential tool for their day-to-day lives. Everything is now available on an app that is taken for granted. For instance mobile banking has changed the conventional approach of banking, which has made the process more efficient. Nevertheless a cohort of individuals will avoid the use of technology and prefer to keep their approach traditional, as they have negative views on technology and the implications that can occur due to its presence. These trends are usually noticed in elder generations as they

feel that bedside manner is eroding. Despite this, technology has a big role to play particularly when it comes to globalisation, as it has made the world smaller and interconnected. It has and will have a significant impact on a number of stakeholders as it very dynamic. The opportunities to explore and innovate are endless, which has led to a wide opening of new platforms that would not be discovered without the presence of technology. However people will argue that it is taking over our contemporary lives. At the end of the day technology has become a concept where "One Device Fits All"

Child Monitoring - Protection or Invasion?

Lottie Carr, *University of Bath*

Throughout time, there is an increasing number of dangers present. Specifically, those from which parents are desperate to protect their precious children. One of the ways parents are now trying to achieve this is by using fast-developing technology available. As technology advances, everyone wants everything immediately and accessibly. For example, parents of young infants are keen to keep their baby close, via monitoring systems with cameras connected to their smartphones. It has been discovered that these monitoring systems have many weaknesses present. To connect to the smartphones, these systems must be able to connect to the internet, this allows connections to other, potentially malicious, systems. This poses massive safety concerns for children. The advances we make in technology will not benefit us if they expose weaknesses with negative results that outweigh the positive effects of the development. Black Mirror is a TV series that highlights the potential of, and dangers associated with, technology. In one episode, called "Arkangel", the story follows a mother attempting to protect her child through the use of a monitoring system placed in the child's brain, called "Arkangel" that connects to the mother's tablet. This system allows streaming of the child's view, monitoring of their physical and mental wellbeing, via observing the chemicals and hormones present in the child's body. The system is also capable of pixelating disturbing images that cause raised stress levels in the child. I will be addressing the dark side of child monitoring systems, and the ethics behind "Arkangel" in my poster.

The Type 1 Diabetes Technology Revolution

Megan Briers, *University of St Andrews*

Since the invention of the insulin pump by Kamen in the 1970s, the technology that assists Type 1 Diabetics has taken massive steps to helping improve lives. Wearable tech and food nutrition databases allow Diabetics take control back over their blood glucose levels. The technology is always evolving with more advanced options being readily available. As the technologies continue to advance towards a fully integrable artificial pancreas, many milestones have been passed. One example is the MiniMed 670G Insulin Pump System, which was the first product to feature a hybrid closed loop system. This means the pump automatically adjusts certain features of insulin delivery based on continuous monitoring of glucose levels. It is able to do this using a sensor called Guardian 3, which is reported to be

80% smaller than its predecessor. The pump began distribution in Europe towards the end of 2018, just two years after initial approval in the US. These various technologies mean Diabetics are more likely to achieve optimal glucose levels, minimising the risks of long term complications and improving their quality of life. Obtaining optimal glucose levels allows for a substantial reduction in the incidence of microvascular and macrovascular complications for Type 1 Diabetics. Technology is helping us into a new age of Diabetes assistance, striving towards a Diabetes free future.

Quantum cryptography: will our data remain secure?

Molly Ives, *University of Bath*

The area of quantum computing is a new and exciting area that has been described as "[having] the potential to revolutionise how we use data and power machines", but whilst many people think about the promising aspects, one area poses a large threat to security if not dealt with properly: quantum cryptography. Current classical computers use RSA to encrypt data, which involves finding prime factors of a very large number, something that would take years to crack. That is unless a quantum computer is involved. Using Shor's algorithm, a quantum algorithm running in polynomial time, a quantum computer could utilise the fact that qubits can be in a superposition of both binary states at once in order to factorize these numbers at incredibly high speeds. If these computers were to be introduced into the everyday world, cryptography as we know it would change dramatically. There are methods of encrypting using quantum mechanics, but if hackers were able to utilise Shor's algorithm before RSA is replaced, then we are in trouble. This poster will explore the ethics and feasibility of quantum cryptography: is it up to the government to hold back quantum technology to secure data? How quickly could the current system of encryption be refactored? And ultimately: who will win: the quantum securer or the quantum hacker?

A Question of Drones: Public Security, Menace or Moral Hazards?

Nameera Simran, *University of Greenwich*

Issues surrounding drones have become a major concern to authorities and the general public in recent years. The poster will present research on privacy and security issues caused by drone and possible solutions to those issues. Over the past few years, there has been news reports in which drones have flown to people's houses and captured images and videos from their windows which caused privacy concerns as people may want reasonable expectation of privacy and which is being invaded by drones. A security issue caused by drones would be if there is a light weight weapon attached to the drone and is dropped on someone which can be life-threatening. Another security issue would be related to corporate espionage as other companies can use drones to spy on their rival's property to see if they are able to gather any information. Other security issues would include collisions of drones

causing serious injuries to the public, hacking using drones, smuggling of illegal products etc. However, there have been cyber security measures and legislations introduced to provide the public protection from drones. Setting up a drone-assisted public safety network and detecting intrusion system are actions which has been taken to solve the concerns raised due to drones. In December 2018, Gatwick Airport has been shut down due to drones flying over the airfield which led about 10,000 passengers to wait at the airport as it was shut down. A similar incident has taken place at Heathrow Airport recently which has caused flights to get diverted and departures had been stopped. Therefore, drones can cause public security, menace and moral hazards if used in the wrong way, but solutions can be developed in order to solve these problems. The poster will expand on current attempts to tackle the problem of drone interference, specifically on the use of radar and jamming systems, shoulder-mounted guns, anti-drone lasers, specially trained eagles and ban and restrictions. These solutions have been used by different countries around the world to counter the threats caused by drones.

Robotic coffee

Pratiksha Saha, *University of St Andrews*

Revolutionising space, complex surgery, even romantic relationships, robots continue to automate increasingly complex processes, but for the average human, robotisation can impact something much more necessary to human survival: coffee. Bbox's bean brewing barista bots have been implemented in their cafe in Berkeley, and has rapidly become a regular detour for caffeine addicts nearby. Adapting the structure of the taxi cab hailing organisation Uber, customers can now order a coffee and a snack with a quick tap and be prepped for collecting it from the store when it's ready. No one likes queues and this app makes the coffee run experience more efficient and easier for the busy worker. Skeptics question the financial side of this automated process, but not employing people has proven to lower Bbox's overhead markedly, enabling Bbox to look at accessing more local ingredient alternatives, aiding local businesses in the Berkeley area. But what this process perhaps undermines is the culture of coffee shops, the kind of back and forth hustle and bustle of baristas and customers hanging around waiting for their drinks is an environment that is hard to recreate with robots. Automation has the power to focus human minds on innovation and discovery by making everyday tasks much more efficient, and the fact that this is being put into practice is truly inspiring.

Development of prosthetic limbs with the help of computing science

Sarah Cleland, *University of Stirling*

Traditionally, prosthetic limbs have been restrictive to the user based upon the limitations of how people can interact with them. Trying to capture specific muscle movements and

independent movement has proven difficult in the past but with the development of artificial intelligence, brain waves can be captured using non-invasive devices and specific movements can be assigned to the patterns creating fluid movements for the user. These advancements are hugely beneficial when helping those who have lost limbs recuperate with prosthetics which closely mimic missing limbs. Non-invasive devices reduce the risk of infection after surgery and the easier to use limbs allows for familiar movements and independence for the user. As the AI learns the user's specific brainwave patterns for control, gradually control becomes easier and less forced.

The EU liminal territory emerging border control paradigm: a high tech update to the "medieval solution" of the country border wall?

Sarah Phillips, *Open University*

A wall is a "medieval solution" that works, as President Trump has recently commented (1) ; opaque algorithms might provide a more modern, high-tech solution, linked with the EU's development of a hotspot paradigm on liminal territories such as borders and coastlines as part of the EU's "emerging border regime" (2). High-tech defence systems using opaque algorithms in a satellite-maintained, microwave algorithm vector field on liminal territories could form a vital part of countries' individual defence systems, and could also act as a buffer zone to limit bad weather effects, to aid security and crop growth. How might technology be best used to maximise the opportunities this new paradigm could offer the world? A prerequisite, for example, would be that air and sea travel would need to continue safely, e.g. based on a GPS tagging system for all air & sea traffic needing to cross liminal territories. The effects on wildlife, particularly coastal dwellers and migrators, might be mitigated with technological means, such as GPS tagging. Ensuring information, safety advice and warnings are made available as soon as possible for people travelling between countries and for other users (online, through alerts sent to users' mobile devices and to broadcast media such as radio & TV), would also be a priority which technology could facilitate. This is an emerging paradigm which offers many new opportunities for development & useful industry.

(1) Portnoy, S. Trump concedes wall is "medieval solution," but says it works (CBS News, January 9 2019) Available at

<https://www.cbsnews.com/news/trump-signs-anti-trafficking-bill-after-prime-time-speech-today-live-updates/> Accessed 22 January 2019

(2) Papoutsis, A., Painter, J., Papada, E. & Vradis, A. The EC hotspot approach in Greece: creating liminal EU territory (Journal of Ethnic and Migration Studies, 2018) Available at <https://www.tandfonline.com/doi/abs/10.1080/1369183X.2018.1468351> Accessed 22 January 2019

Can You Prove You're Human?

Tallie Blanshard, *University of Edinburgh*

If given an answer to a question would you be able to determine whether the answer was written by a computer or a human? This is the basis of the Turing Test, or the Imitation Game as it was referred to in Alan Turing's 1950s paper "Computing Machinery and Intelligence". Based off a Victorian party game, the test was designed to see whether a computer could pretend to be human enough to fool a person into thinking it was human. However, whilst this test was designed for leading-edge artificial intelligence and computing back in the 20th century, is it still relevant today? This poster will examine some of the previous attempts at passing the Turing Test - has anything ever managed to pass? Does the test have any flaws and, if so, were they always there? It will also look at how we use the Turing Test in our everyday lives, and question whether there are better alternatives. You're bound to have encountered those frustrating CAPTCHA tests online, which are nothing more than the Turing Test in reverse, as you try to prove that you are human and not a computer, often in vain. As technology advances, these are getting more and more difficult for humans to pass. So should we still be using the Turing Test as an end goal or is it finally time to move on?

Is a Cyber War on Its Way?

Tanacha Khanchai, *University of Bath*

To say our lives are dependent on technology may be an understatement. Technological advancements have enabled us to do things that we never thought would be possible. But are you aware that technology is a double-edged sword? Use it wisely and it will benefit you. Use it without caution and you may find yourself in a predicament. This is because there is no such thing as a perfect technology. Just like humans, your smartphones, laptops and computers also have weaknesses. And these flaws could be exploited and used as weapons against you. To summarise, we are living in a world where a large amount of damage can be caused by a few mouse clicks. In 2010, Stuxnet crippled Iran's program to develop nuclear weapons; it was reported that around 1000 centrifuges were destroyed at Natanz as a result of this cyberweapon. Now, in 2019, the Age of the Internet of Things, there are limitless possibilities of cyber-mayhem. We have more advanced technologies, more knowledge and more inventions. How deadly would a weapon created with that combination be?

Sensing robotics in agriculture industries

Yao Qu, *Durham University*

An increase in demand for food production due to the increasing global population and decreasing availability of human labourers has made substantial impacts on the approach used in modern farming. Precision agriculture utilises technology to offer solutions to the increasing demands, it incorporates real-time data collection to enable better control of field environment to maximise yield production. An example of this is the use of remote sensing technology to monitor soil moisture level at locations with unpredictable rainfall. An early warning of soil moisture variation allows immediate actions to be taken to stabilise the environment before crops are affected. The use of technology means that the need for human labourers to visit the crop field frequently will be reduced which would be particularly beneficial for crops growing near environment that are hazardous or difficult to travel to. With the implementation of autonomous and remote sensing technology in agricultural industries, it will reduce the workload for human workers and allow workers to work more efficiently and focus on tasks that require more attention. Despite the growing reliance on robotics, it is paramount to recognise and acknowledge that the introduction of robotics is to assist humans and should not be used to replace current farming interventions. My current research aims to examine the benefits of adopting spherical shape into sensing robotics and its impact on the surrounding crops.

SECOND YEAR STUDENTS

When Less isn't always More

Afka Naela pranoto, *Middlesex University*

The early days of the web consists of pages filled with predominantly text and hyperlinks found every other sentence. There was no way to style websites yet, its purpose for researchers to share information in an easily accessible database. As it grows, and with more members of the public using it, came JavaScript and CSS in the mid-90s. People quickly adopted it, making use of the many features available to create custom webpages unique to their personality. It became a time of patterned backgrounds, flashing colours, and marquees. Everyone and their aunt had their own website. The dot com boom came and went, and the styling of websites matured into creating a more glossy and realistic appearance. This style stayed as the standard for websites for many years before a new trend emerges. In came the rise of minimalistic themes and flat UIs. With its goal of providing a clean and clutter-free experience, webpages are stripped down to emphasizing its content over anything else, this makes it more comparable to how webpages looked in its early conception over how they might look just less than 10 years ago. For my poster, I will look into this trend, and weigh in on the good and bad sides of creating minimalistic websites (and interfaces in general). Its simplistic style makes contents easier to read, for example.

Hacking Hackathon Diversity

Alexandra Krajewski, *Durham University*

Hackathons are popular coding events where participants create a solution (otherwise known as a 'hack') responding to a theme or prompt. They attract all kinds of students that have an interest in tech, not just those studying Computer Science. Companies and banks often have their own hackathons where they look for very specific solutions, but there is a growing abundance of university level hackathons which strive towards networking, collaboration, and a fun learning environment, rather than a huge competitive environment which usually accompanies company hackathons. Thus, hackathons greatly benefit participants in offering a unique collaborative and networking experience where they have a chance to also develop a tangible product. While DurHack (Durham University Computing Society's hackathon) 2018 had great student attendance, we had a very low diversity rating. This poster investigates the methods and incentives that successfully translate to a larger level of diversity in hackathons, with an overall aim to create a diverse and colorful collaborative environment for DurHack 2019. This can further inform other university hackathons around the world. Investigating this will help us put on a better event this year that will benefit the quality of the experience for all of the participants and sponsors.

The Escalating Influence of Big Data on Ecommerce

Alice Bjaaland, *University of Bath*

In today's world, every single bit of information stored about a person and everything they interact with has a value. The number of devices connected to the internet is estimated to reach 25 billion by 2020 with almost every action made by these devices is being recorded, producing an unimaginable amount of data. Over the last ten years data has assumed value and become a new form of currency. Companies now trade data to obtain a preferred set to target a specific audience; however, people remain largely unaware of exactly how their personal data are being used and exploited. Data alone are useless; the value lies in what companies choose to do with it. Many store personal data about their customers and then use this to either gain insight into the person or sell it to other companies who can use it to their advantage. Artificial intelligence, specifically machine learning, is an ever-growing area of computer science where more and more algorithms are being developed to target each and every customer. Well known algorithms such as K-Means Clustering, Linear Regression and Logistic Regression are now being widely used by to uncover hidden patterns and correlations between customer and product. Data are also being used to retain customer loyalty, to grow their customer base and to calculate risk of innovation and the development of new products, but at what cost to the customer?

Improving the country's cyber hygiene

Amy Hudspith, *Durham University*

As you will be aware, cyber security is a major issue in today's world. We are working hard to increase the top-level understanding of cyber security and developing strategies to keep us at the forefront of the cyber landscape. Unfortunately, I feel the general public's understanding is severely lacking. I imagine a similar initiative to the "Catch it, bin it, kill it" campaign; something that is clear and concise, and that can be easily applied to all areas of life. More and more cyber criminals are changing their method of attack to those areas of society with weaker cyber defensives. Therefore, I feel we need to now focus some of our attention on helping the public create better cyber hygiene habits. I suggest that we pick some specific areas e.g. password reuse, email attachments, phishing attacks, access to devices. This poster will talk about how the aforementioned areas cover a large amount of the cyberspace that the general public interact with, the risks associated with them, and how we could go about educating the general public in a concise and effective way.

Smartphone Identification Using Convolutional Neural Networks and Uploaded Social Media Images

Anastasia Taylor, *University of Buckingham*

When a digital image is captured by a smartphone camera, the details of the camera maker and model are included in the metadata along with other information such as latitude and longitude. This can be modified or erased, so examining the metadata alone is not a dependable way to determine the source smartphone of the image. People may decide to remove this metadata to prevent the image from being traced back to them. When an image is transferred from one device to another using a messaging application or uploaded to social media, the metadata is removed and post-processing such as compression occurs. The majority of previous studies have researched the accuracy of image source identification when the image has been cropped or resized, but this project concentrates on how post-processing of an image when uploaded to different social media platforms affects accuracy of source identification. This is because it has become an extremely prevalent method of sharing images and will only be used more frequently in the future. This project focuses on the use of machine learning techniques to identify the smartphone model used to capture a digital image. Image features are used as input into a convolutional neural network (CNN). Image features refer to the numerical information extracted from images that help to describe the characteristics of the camera and the image capturing and digitisation process. These can be referred to as fingerprints because they are unique to a particular smartphone camera model or even to a particular device.

Social Media for Wildfire management

Annette Reid, *University of Bath*

Social media could be a source of information for wildfire management. The deadly wildfires throughout California in 2018 produced a huge following on social media, with victims, neighbors and emergency services posting regular updates on the fires' progress. The speed at which wildfires are capable of spreading while occurring in multiple areas makes it difficult to gain information about them quickly. Information about ongoing disasters is required by first responders to maximise their effectiveness in preventing further spreading and assisting nearby individuals in evacuating the area quickly. A source of information could be social media, particularly in areas with limited or no local emergency services able to see the unfolding disaster. Social media's wide usage with individuals posting what they can see, locations and photographs creates large amounts of data in a short period of time during ongoing wildfires. By processing social media posts with particular keywords or locations first respondents, charities and governments can gain valuable insight into the location and magnitude of a wildfire. This information can assist in rapid response and effective use of resources resulting in saving lives and millions of dollars in infrastructure and

clean-up costs. In the future, this data can be used on a variety of different disasters, natural and man-made, as well as learning how to manage disasters in the future. Social media's speed at producing large amounts of information on ongoing events makes it a possible source of information for first responders reacting to wildfires.

High Altitude Computing

Bridget Meade, *University of Stirling*

For those who dare to hike at high altitudes, there are many risk factors. At high altitudes, the atmosphere is unkind with reduced air pressure and low oxygen levels. For those who are not acclimatized, this can be a deadly environment to be in. For many of these treks, porters or Sherpa will accompany hikers, not only to assist you with equipment but also, to look out for any signs of Altitude sickness. There are several symptoms you might experience such as dizziness, headache, rapid heart rate, and Nausea or vomiting. However, even with years of experience, the symptoms may go undetected or confused with another condition. How can computing be introduced to help at high altitude? Modern technology such as Apple iPads is being used for navigation through the mountains by Himalayan rescue helicopters. However, let's think more about prevention. Devices which monitor heart rate and oxygen saturation, such as an oximeter, are key to check if an individual is getting enough oxygen. Combine this with exercise and sleep recognition, and we begin to develop a clear view of how the body is acclimatizing. Is it possible to develop technology to aid hikers effectively? With this aid, could the percentage of individuals who suffer from the effects of high altitude be decreased?

They are listening

Cara Murphy, *University of Stirling*

Breaking news: a new smart device has a "hidden" microphone. Supposedly it was not a secret, but the company in question accidentally forgot to mention it. They forgot to tell thousands of their customers that their new home security device could be listening to them. Another day, another news story about our privacy being invaded. I asked my twenty year old sister what she thinks about this news story. She doesn't mind. Is there no limit to how far the human race will go for an easy life? In early 2018 the news was eclipsed by a major scandal involving leaked personal data. Information from social media accounts was leaked to a company who used this information to try and influence people politically. So, obviously after this major brainwashing scandal everyone boycotted this social media platform. Except they didn't. The networking giant is still as popular as ever. "Sure they did leak my private information, but how else am I going to be able to see what my school friends engagement ring looks like?" The internet is full of conspiracies about big companies spying on us for advertisement or more sinister theories that the government is listening to us to help control how we vote. What is interesting to me though, is the fact that people know this. It is not just

a theory all the news headlines prove it to be true. However a large proportion of people still sleep with their smart phones in their bed.

A hairy problem

Carolina Colagrossi, *Imperial College London*

Their stories are moving, their characters are charming, and their hair blows in the wind, incredibly realistic and unparalleled by anything else. For over twenty years Pixar has been one of the leaders in computer graphics and twenty-seven out of thirty of the last Oscar winners owe their amazing visuals to Pixar's technology. One of the most vital parts to a character is their hair (or fur). It is also one of the most challenging parts to animate. Long hair is notoriously hard to model, as a single person can have tens of thousands of individual hairs, their movement not only governed by gravity but influenced by collisions with each other and by their elasticity. Hair is expression of one's individuality: Merida's fiery curls (*Brave* 2012) are an expression of her free soul; hair can make a scene come to life, as we can see in the *Incredibles 2* (2018), when Helen's hair blows wildly as she chases a train in her motorbike; hair can make the difference between a fluffy friendly monster and a scary one. The photo realism that Pixar has achieved with the rendering of hair is both a storytelling and computer graphics wonder.

Coding in Purl

Charlotte Wrings, *University of York*

Fiber arts and computing have been entwined as long as the two fields have both existed. The very first programs written by Lovelace were designed to be set onto punchcards, inspired by the looms designed by the frenchman Jacquard. To anyone who has an interest in both fields, the connection seems obvious. Any pattern will contain, at the very least, the familiar structure of `while` loops. The more complicated the pattern gets, however, the more the similarities appear: One might even call a pattern a program that the fiber artist executes. This is particularly noticeable with knitting, given the format patterns tend to be in - a format regular enough that the programmer Janelle Shane was able to train a neural network to generate some, with mixed success. If the program is executable, though, one might wonder how to compile it. Could we, given a knitting pattern written in plain english (or as close as knitting patterns get, which is a small leap), and a low level machine that's designed for this purpose, compile the pattern to execute on the machine? Join me to have a look at what such a compiler might look like, and what challenges might arise at every level.

Digital Farming - How technology can help agricultural productivity

Christine Mathiesen, *University of Bath*

In recent history, the applications of artificial intelligence have exploded throughout the technology industry. It is difficult to reach the end of your daily news update without encountering several articles referencing AI. Almost in parallel, the impacts of global warming are also spreading like wildfire across global news sites. Protesters have been taking to the streets across the globe as the world's climate continues to spiral into unknown territory. One of the most severely affected sectors is agriculture, with impacts of global warming such as increased carbon dioxide levels, rising temperatures, and severe drought all having negative effects on crop yields. Finding a solution to help mitigate these impacts will be essential to ensure that the next prolific news segment isn't global famine. Innovation in technologies such as data intelligence from AI algorithms and Internet of Things (IoT) devices that can sense surroundings could provide aid in tackling these problems. Studies have shown that crop yields will need to more than double by 2050 to meet rising demand. With fresh water levels shrinking and arable land decreasing, this rapidly becomes a terrifying issue. Computer vision and AI could provide ways for farmers to optimize yields by predicting and analysing how the land is behaving. This poster will look into leading research on optimising agricultural yields with the use of technology.

Akka versus Erlang: which to use when

Cristina Tincu, *Middlesex University*

Over the past few years, there has been a growing demand for the development of efficient and secure systems that are complex. One of the crucial tools to achieve these expectations is the use of a programming language that must satisfy some fundamental requirements, for example, a language must be tolerant of software failures and suitable for use on multicore machines. In this poster, two concurrent programming languages are considered: Erlang and Scala with the Akka framework. The commercial use of Erlang began in early 1990s, being implemented in the Ericsson company to maintain large real-time systems. This language was created particularly to deal with massive concurrency. One of the most popular messaging applications in the world, WhatsApp, has its back end based on Erlang. Thus, allowing over four hundred and fifty million users to benefit off it on a daily basis. But, for many other companies, compatibility is a much more important question. To address this issue, in 2004 Scala appeared, a multi-paradigm programming language that provides interoperability with java, making possible usage of a wide range of libraries. On top of that, a toolkit called Akka was developed in order to build concurrent and distributed applications, which has many features inspired from Erlang. This poster first discusses the advantages and disadvantages of Akka versus Erlang. Then it analyses how to integrate modules written

in either of the two languages into a system. Finally, it recommends which of these to use when.

The JavaScript Battlefield

Eilidh Southren, *Robert Gordon University*

React, Vue, Angular (JS, 2 and 4), Ember, Mithril, JQuery, Node.js, Auralia, Polymer, ...¶
 The list is endless. Web development got weird in the last 10 years. Where do you start? Which framework do you give your valuable time and energy to learn? For a business, this cost is exponentially greater: throwing a large sum of money to create something in a framework which then becomes unsupported and unstable has the potential to cause havoc. JavaScript frameworks rise and fall with the zeitgeist. Now, with the world's largest tech companies throwing their weight behind their own frameworks, will it be enough to keep them around for longer? In the case of React (Facebook) and Angular (Google), it seems to be working. And yet, from the sidelines, the underdogs emerge: the tech evangelists are hired to spread the gospel, and the online battles are fought. It's a digitally bloody mess of fractured web development and in the end, nobody benefits. This project aims to analyse the rise and fall of the most popularly used Javascript frameworks. By fitting a regression analysis model to data such as the number of Github pull requests and Stack Overflow questions asked, can we predict who will survive the battle of the frameworks?

Technology and children: is it all fun and games?

Elena Pederiva, *Edinburgh Napier University*

Whenever adults are questioned about the games of their childhood a lot of responses are "hide and seek", "tag", and "rock, paper, scissors", but what changed in the last decades? Over the past years, technology among teens is been used more and more. Apart from smartphones and tablet we can find a large variety of technology that supports children in their learning in different ways. The debate that often raises in this case is if technology in such an early stage is beneficial or harmful. Of course, depending on what technology and how often is used is fundamental to understand this. Depending on each child and the help of their families and teachers, there are many ways that the children could benefit from the use of technology. Technology is a great way to experiment with creativity and freedom of expression and it can help in socialization and relationship building. We're going to talk about the benefits and how children interact with technology, based on experience and data gathering during a project in an elementary school of Edinburgh.

The increase of technotrash

Hester Gent, *University of Bath*

With companies like Apple and Samsung releasing smartphones very regularly, in some cases within months of each other, consumers are tempted to buy the latest and greatest phone on the market as soon as it comes out. Whilst most consumers don't buy a new phone within months of the last phone they bought, it is typical for consumers to buy a new phone every two years. In my poster I'm going to focus on the effects of buying a new phone this often. One such effect is that people throw away their old phones when they get a new one, resulting in increasing amounts of technotrash. Technotrash refers to electronic waste - typically smartphones, computer-related parts and computers themselves. This type of waste has many consequences that affect the environment, as many people don't recycle their unwanted devices. The production of electronic goods also involves rare and finite materials, some of which are obtained via methods that create harmful by-products to humans and the environment. I will also discuss what we as individuals can do to reduce this issue. For example, as individuals we can buy our phones from companies that maintain support for older models or phones that have replaceable parts. It also falls on the individual to consider what they are gaining when they want to upgrade their phone.

Will Computer Science Cure Cancer?

Isla Roberts, *University of Stirling*

One main thing separates man from machine. Mortality. Bioinformatics refers to the use of computer science theories and software in solving biological problems. With medical technology improving rapidly focus shifts to curing some of the largest illnesses and diseases faced by mankind. Will it be possible for computer science to aid in the cure of Cancer, HIV and other diseases that plague mankind, as it has aided in other areas of the medical field such as limb replacement and minimally-invasive surgery? Using Artificial intelligence and machine learning it may be possible to combat these and other illnesses in a more effective way, from improved and more accurate diagnosis to implementing systems that will help fight the disease. Computer Science can be used to build upon the current radiology systems in order to catch things like cancer earlier and to offer a more insightful look into how the disease is progressing. The use of wearable technology could also assist in fighting deadly diseases. By monitoring the health of the wearer and comparing to what should be considered 'normal', the diagnosis time could be significantly shortened, with early warning signs being picked up far easier through the use of technology and software. Earlier diagnosis ensures a faster start to treatment which can lead to a higher chance of survival. Wearable technology such as this -which reports on the signs, symptoms, diagnosis, progression and the result of the disease- could also be used to look for cures by furthering our understanding of how these illnesses develop and interact with the human body.

Applications of Brain-Computer Interfaces

Jade Cutler, *University of Bath*

Our brain is the command center of the human nervous system. It uses signals from the sensory organs to decide which muscles act in response. If the brain ever becomes damaged, it is important to find ways to mend it or simulate what was once possible. Research has been conducted into using brain-computer interfaces to assist with a range of health issues caused by part of the brain malfunctioning. Some notable uses are helping with Parkinson's and memory loss as seen in Alzheimer's, as well as sensory substitution. This consists of one sense's input being replaced with the input of another whilst keeping the main uses of the original. Neural implants can also be used to control devices and machines external to the body, such as exoskeletons to help people cope with partial or complete paralysis. The implant is usually placed on the cerebral cortex of the brain (i.e. the outer layer of neural tissue) where they stimulate, block, or record the signals from single or groups of neurons. However, some implants can be injected into the bloodstream as a less invasive option with possibly less scar tissue forming. Although these uses seem to be promising solutions to many problems, the implants can be hacked allowing cyber criminals to intercept sensitive data, prevent the user from speaking, and even cause paralysis. If these implants are researched further without sufficient cyber-security, criminals could take over an implant and hold memories to ransom or manipulate the user by implanting or deleting certain memories.

Could virtual reality be the demise of reality?

Julia Feltham, *University of Bath*

When most people hear the term 'virtual reality' the gaming industry probably comes to mind, however it is now becoming clear it will soon change all aspects of our lives. Instead of learning recipes from a 2D screen, you could be welcomed into a chef's kitchen and shown 'in person' how to make a dish. Instead of travelling the world you could explore anywhere from the comfort of your living room, but is this experiencing life? Instead of flying across the world to see loved ones you could invite them into your home and have a catch up in seconds, but does this mean you may never see them again? The VR market is expected to grow from USD 7.90 Billion in 2018 to USD 34.08 Billion by 2023 with most of this growth being due to growing demand for AR in healthcare, retail and e-commerce. It won't be long till you couldn't imagine life without VR and wonder how you coped without it. Steven Spielberg's science fiction novel 'Ready Player One' could be seen as a warning of how VR may soon become our preferred reality. Set in 2044, it shows a world people leaving their grim real lives by escaping into a virtual reality world known as the "OASIS". Could it be that lines between our virtual reality and our actual reality become blurred and people choose to escape to a virtual way of life, leaving the real world behind?

Introducing autonomous vehicles: safely navigating the hazards

Juliet Flavell, *Royal Holloway*

The government has set 2021 as its target date for fully autonomous vehicles to be in use on public roads in the UK. A future looks set to unfold where driverless cars and smart cities running on cutting-edge technology will provide new models of on-demand transport and mobility services, all fuelled by data. Development towards autonomy seems to be in the fast lane, but how will the hazards be navigated? This work investigates this problem: as they are computer systems, CAVs will rely on being secure to be safe. How will this security be assured? It remains to be seen whether current approaches to security and risk assessment are effective. A unique set of cyber security vulnerabilities and requirements arises due to the impact of the unprecedented scale and complexity of CAV systems, both in isolation and as nodes in the intelligent transport networks they rely on. Existing security techniques may not suffice but the need for advanced techniques may not yet be fully understood and budgets may not be available. The expertise needed to address all the challenges spans many different disciplines: safety will rely on security and the two disciplines should work together but there may be a culture clash. Work has begun on updating legislation because existing legislation and standards do not accommodate CAV implementation adequately. This uncertainty may stifle innovation and this unique set of problems might threaten the target date of 2021.

7th Gen Poetical Science

Katherine Alvarez, *University of Greenwich*

Lovelace once requested that if she could not have poesy, she would have poetical science. I often wonder if she ever experienced softness as an antonym of hardware. Logic and achievement as different sides of a coin that always lands on its edge; empathy and modesty as symptoms of the poetically predisposed. In Computing, we are taught that a single core processor is more inadequate than a dual. Multi processors are superior and will cover most of our needs from robust IDE's installation, running virtualized environments and even simpler tasks like watching Episode IV in ASCII via Telnet Terminal*. The processing speed and attributes of our machines are an analogy of the different processes that take place within us. As new technology provides us rich interdisciplinary experiences, the amount of e-learning content and the variety of delivery channels can feel overwhelming and essential when compared to the stillness of a programming textbook with soon to be obsolete instructions to technologies that may be replaced. Similarly, human interactions in an industrious city are resplendent and rapid. The prospect of slowing down implies a downgrade; yet, in the middle of a crowded Canary Wharf platform, a Nokia 3310 is distinctive and defiant. This idiosyncratic Nokia user must not be interested in online dating

apps as those are for hyperthreading people; which brings me to this question: If Ada was single today, would she be on Tinder? I suppose the answer to that is GDPR compliant.

*Some operating systems may require telnet enabling: [telnet towel.blinkenlights.nl](http://telnet.towel.blinkenlights.nl)

The Future of AI is Tattooed in Ink

Kira Paul-Fitton, *Aberystwyth University*

Realistically the term STEM is outdated and an inaccurate representation of our industry. Something more fitting is STEAM (add Arts). From African tribes using fractals when building their villages to sketching storyboards for games. The future holds greater synergy between disciplines but something that has captured my curiosity is the involvement of body modification (BM) and AI. The BM industry has a history of using technology to enhance humans both aesthetically and functionally. Many of us already have an array of metric apps as well as wearables to accumulate personal data from exoskeletons to RFID tags to brain-computer interfaces. Following along the same frame of reference, tattoos are ink micro-embedded into the body. Tattooing is another medium to bring cyborgs closer to our reality. The interests of both roboticists and data scientists is leading to an interesting fusion of arts and androids. This is already in action: 'Tatoué', a machine capable of tattooing computer-generated designs via a 3D printer. Currently there are people walking around with obscure micro-dermal add-ons. Machinery such a Tatoué has the capacity to revolutionise not only the tattoo industry but the wearable technology sector. I predict that there is huge potential to use electric ink to tattoo keyboards, sensors or even storage onto the human body. Tech embedded tattoos could revolutionise the way we create storage, transfer data and interact with other technology. So why not something that doesn't require you to remember to charge it?

Is our online data really our own?

Kirsty Carotti, *University of Bath*

With over 4,388,000,000 active internet users worldwide, we now live in a society that would not be able to function without being constantly plugged in. We are sharing our personal data with websites and companies, with the click of the button our cookies which are little chunks of data about our web-activity that are stored in a huge online database. This data is mainly used by companies to provide a personal online advertisement experience, however can this data be used against us? It is common superstition that the government has access to internet activity with people believing that they can see through your webcam on any device connected to the internet. I will be exploring the ethical and moral issues that would arise from the government storing this personal and sometimes quite sensitive data. Countries such as China and North Korea are known for monitoring and heavily restricting access to certain webpages, however countries such as the UK do restrict certain websites as well. The inequalities between different countries in the access they provide to their

citizens sparks the question, should all countries have equal access to the so-called 'world-wide-web'? With all the information so readily available to certain people and "google" becoming a verb in its own right instead of just a search engine, what information is still kept from the average users' fingertips? My poster will discuss the issues raised as well as how some users get around the censorship of internet content, via networks like Tor.

Self-help apps in regards to mental health

Laura Marie Wilkinson, *Aberystwyth University*

There has been a significant rise of self-help applications over the last few years, on a range of devices from mobile to desktop. A lot of applications either use "unguided internet-based self-help" or "periodic professional contact". This is showing that individuals are acknowledging mental health issues more despite the social stigma. They are more open-minded to the psychological issues and increasing acceptance to discuss mental health. These applications use the techniques of professionals and allow clients to access this help - no matter the social and financial standing of the individual. Anonymity of this process also helps as the individual can feel more secure and comfortable, as the process is private and personal. The increasing power of technology allows for more bespoke software for users - increasing the level of support for clients. However, as useful as these applications are - everyone has a unique situation and needs a certain level of support. It is always useful to consult your GP or mental health professional so they can guide you down the correct route of help. In conclusion, self-help applications can be very positive in living with mental health issues - provided the individual takes the correct steps to get the support needed. The private nature of this leads to an increase of anonymity which can make the experience of "self-help" more rewarding and positive. With this in mind, the stigma of mental health should reduce if it follows the current trends that the newer generation are showing.

Cyflawni Cymraeg 2050: rhwydweithiau niwclear ar gyfer yr Iaith Gymraeg (Achieving Cymraeg 2050: Neural networks for the Welsh Language)

Leena Sarah Farhat, *Aberystwyth University*

What if your mother tongue is an ancient language of a land that you've never lived in, whose native speakers have broken centuries of silence? The current Welsh government vision is to reach 1 million Welsh speakers by 2050, known as Cymraeg 2050. It notes the importance of technology for the future of the Welsh language, and the necessity for technology to support Welsh, for the language to be used in as many situations as possible. This is easier said than done. There is no standardised or definitive form of the Welsh language. There are 5 traditional versions of the language. This means that the vocabulary and sentence structure can vary drastically between them. The government has identified

three main technological applications to help reach the Cymraeg 2050 goal; Welsh Language Speech Technology, Computer-assisted translation, Conversational Artificial Intelligence. The main link for this could be the use of neural networks for dialect identification which is what this project explores. This foundation will be paramount for all three technological applications as it will help modernize the uses for the Welsh while making us be prouder and more forthcoming to speak the language, not to mention the impact it will have on learners and raising awareness of the language's existence. This model could even help save other Pro-Brythonic languages, challenging the idea of British identity.

It has been said "Cenedl heb iaith, cenedl heb galon": A nation without a language is a nation without a heart.

From Tech to Plate: How technology has an impact on what we eat

Liberty Curtis, *University of Bath*

Businesses in the food industry are busy collecting your personal data, and they are hungry for even more. In fact, just how often you're searching for that perfect kale-spinach-apple ratio for your morning smoothie (or perhaps the count of take-outs you've ordered online this month) may just be the key piece of data found in data mining to provide the industry with the correct nutrients for economic growth. Clever use of such data patterns can have an extraordinary impact on what we put on our plate, and that's not the only contributing factor. Social media has a huge part to play in what we think we should be putting into our bodies, which has undoubtedly had a contribution to the rise of eating disorders and low self-esteem. Furthermore, analytical processing has enabled the prediction of foods trends in the years to come (chickpea water cocktails, anyone?), allowing supermarkets to keep up with so-called food fashion; and some applications even allow us to order a 5-course meal right to our doorstep without even stepping out of bed. In my poster, I will present the different ways in which technology has an impact on what we pick up with our forks, and what more we can expect from this in the future.

What would Avengers be like with Mr Bean as Thor? - How can 'deepfakes' disrupt the film industry?

Luou Wen, *University of Nottingham*

Discoveries in machine learning research has allowed exponential growth in the capabilities of AI technology. With the development of general adversarial networks (GANs), it is now possible to generate fake imagery akin to the original input, even fake text and audio can be generated. Using this class of machine learning algorithms, it is possible to replace actors in scenes without getting the third party involved, generate audio that people have never said,

and create high-fidelity 3D cityscapes from a simple sketch. With so many applications in video and audio manipulation, one question begs to be asked: How could this new technology disrupt the film industry, changing the way actors, directors, and special effects teams work together? This poster will examine current research on the capabilities of GANs and popular techniques currently employed in film editing. It will also investigate the possible effects the accessibility of GANs and its usage can have on society. From the research, it will highlight potential benefits and pitfalls of leveraging machine learning technology in film editing. Finally, it will provide a view on possible disruption that GANs might have on the film industry. For example, could it threaten the position of motion capture technology? For now, Chris Hemsworth is safe as Thor in Avengers, but how long before Mr Bean is wielding his hammer?

Pretty little secrets: How to create the perfect piece

Mari-Nikol Panteva, *Edinburgh Napier University*

Have you ever watched a movie and wondered what was the brilliant mind behind such a fulfilling story? Have you tried guessing the destiny of a certain character? Digital storytelling consists of a few main steps in order to create an incredible Hollywood-like piece. If you have ever thought that every movie has a unique story, this would be the place to break that illusion. In fact, every digital story has the exact same three-act-structure and follows the archetype story pattern called 'The hero's journey' that involves twelve stages that shape the perfect story. As screenplay evolved, the time spent in post-production increased as well. The powerful physiology behind the colors is used to emphasize on particular object, location or moment. The types of shots that help us visualize an idea are hiding significant meanings too. Being aware of the basics of producing a digital story, it would be difficult to get confused or misled again while watching the next great movie. Nowadays, technology is taking such an important part of our lives and most importantly, it is evolving so fast that allows us to create and complete tasks effortlessly. Movie directors are no longer looking for the perfect location for their scenes, or trying to re-build an ancient castle. In fact, the majority of the shots are filmed in a green/blue screen studio and then transformed into the majestic landscapes that the audience sees by the VFX (visual effects) artist.

Drones: the good, the bad and the beautiful

Marian Kenna, *University of Bath*

Drones are an ever evolving technology. However, the public opinion on them is slightly controversial. My inspiration for choosing this topic started when I heard some family friends saying drones were pure evil and should be banned completely. As a lover of technology and a drone owner I was shocked by this statement and strongly disagreed. I see drones as a means to add an extra dimension to the world of photography. And that is only scratching

the surface on their extensive capabilities. I would like to research the positives and negatives of drones and, ultimately, educate people on how drones can be used for so much good. I also want to use this as an opportunity to learn more about drones: their history, how they work and what different types there are out there. I have found that most people think they are quite a new concept when in reality they have been around since 2002 - a whopping 17 years ago. The word drone can prompt a different mental image for different people. Some may think a large machine almost large enough to carry a human while others may picture a small child's toy. In reality there are now countless different types of drones with no one drone being the standard. Within the consumer market they sell at prices ranging from ~£10 to ~£4,000 for a professional drone such as the DJI Phantom 4. And when it comes to the cost of top end military grade drones we might never know.

The Representation of Women in the Media

Maryum Khanum Mirza, *Sheffield Hallam University*

In a world where a swipe of a filter distorts reality, how can one differentiate between reality in its true sense and 'social media reality'; where filters and edited images are the norm and part of the aesthetics of picture-sharing sites? The likes of Instagram and Snapchat have given birth to the 'photo-ready' generation who feel the need to conceal, erase and edit every spot and blemish remotely visible to look flawless. This is perpetuated by the 'no makeup-makeup' trend encouraging females to attain physical 'perfection' without 'letting on' the use of makeup. Why is it females are disproportionately the butt of skincare/makeup advertisements in comparison to their male counterparts? Why is there more emphasis on their physical/outer appearance than the power of their minds? The rarity of unfiltered photos was recently amplified by the trend '#nomakeupselfie' which challenged individuals to post selfies without any makeup/filters; the response was immense, and the trend was hailed as a success raising £8 million for Cancer Research UK in 6 days. £8million for charity today; business deals worth £8million tomorrow - if only we believe. Confidence is the belief and trust within oneself, not something to be painted on. Imagine a world where the heights she climbed are valued more than the height of her heels. Imagine a world where her intellectual brightness impressed more than the brightness of her highlight? Imagine!

The Untold Experience and Perception of an Intelligent Machine

Meshaal Kirmani, *University of Bath*

In a time where artificial intelligence and machine learning are developing at a rapid rate and have the potential to be used in all facets of life, new questions have to be asked about what we can reasonably ask of this technology. What exactly does a machine learn when it's given tons of data and how is it possible for it to predict things that we humans cannot

comprehend? Can we trust some of these predictions? If we consider this intelligence as artificial what if we were to consider its experience in the world it lives in to be artificial? A humanoid robot with sensory capabilities to see, listen and touch will have a completely different perception of the world to a machine limited to a metal box and only perceiving the world through the data it is given. Even in a virtual simulated world like google's DeepMind AI a stick figure can learn with experience how to walk or run through an obstacle course with the body it is given. This style of reinforcement learning is only a simplistic representation of the reinforcement learning with go through as humans. Though we may have a much more complex way of processing information and a deeper experience of the world we live in, We should not undervalue what we can learn from the experience of an artificial intelligence as it may help us better understand a variety of virtual and real world situations that we cannot comprehend as humans.

Driving into the Future - Considerations of Autonomous Vehicles and the effectiveness of Deep Neural Networks.

Millie McQuillin, *Durham University*

In recent times there have been huge advances in autonomous vehicle (AV) technology. Deep neural networks (DNNs) and machine learning have enabled the AVs to be safer and more versatile than ever. Many companies are already trialling cars driven using only sensors such as cameras and LiDAR (though regulations still require a human driver be present). However, DNN's are fallible, and can develop errors. The number of layers of abstraction in DNNs mean mistakes may be easy to detect, but can be difficult to rectify. Such inscrutable technology can raise serious questions if it is to be entrusted with human lives. An arms race has already begun between the biggest players in technology to develop AVs, with the champion potentially able to capitalise on the driving industry entirely, and indefinitely. This poster explores the potential of AVs, while analysing the impact DNNs can continue to have in this field into the future. There are many considerations which need to be taken into account before we can have a totally autonomous road network, it is likely people will no longer need to have their own personal vehicles. There is also the important discussion of how we might train these vehicles to have their own ethical systems, enabling them to make spur of the moment decisions to minimise collateral damage. Finally, we will explore the positive benefits of AVs, including reduced carbon emissions due to better navigational modelling, as well as fewer accidents due to human error.

Using Technology to Assist the Visually Impaired

Nicole Herrington, *University of Stirling*

The World Health Organisation estimates that there are 1.3 billion people living with some form of vision impairment. 217 million have moderate to severe vision impairment and 36 million people are blind. Rapid advancements in technology, specifically smart phones and artificial intelligence, will have a direct impact on improving the way of life for the visually impaired population. The use of technology to assist those with vision issues has been around for many years. The most common example would be a screen reader, allowing a person who is visually impaired to interact with computers and mobile devices.

Advancements are being made in many areas of assistive technology. Two of the disruptive technologies that are changing the way visually impaired people get assistance are wearables and apps using crowdsourcing. Wearable technology such as glasses and watches, can come at a higher cost and in some cases offer a more personalised service.

Apps that are using crowdsourcing to harness a large number of volunteers can be very low cost but may provide a more generic experience. Both methods will benefit in the future from the advancements already underway in artificial intelligence. Improvements in virtual reality and augmented reality in other areas of technology will be used to help the visually impaired. For example, translation apps that were designed for sighted users to hold the camera up to a building and translate a sign will be used for visually impaired people to carry out tasks as complicated as navigating around a city to something as simple as distinguishing the colour of a sweater.

Do we need superheroes? No, just developers.

Patricia Gonzalez, *Edge Hill University*

Nowadays, technology is a concept which is linked to flying cars, holograms and, basically, things developed to ease people's lives and many tasks. Curiously, a high percentage of the population does not think that technology could help us to improve our world, or make it more fair for everyone and help us fix some bad decisions that we have taken (and still do). Big inspirations to this idea are Marvel and DC, which present the world and the society as maids who need to be rescued by a strong man with superpowers and a colorful suit. In our case, change and improvement would instead be empowered by people who decide to give in their time to build a new - and better - world. The objective of this work is to show and discuss different projects lead by some of these personalities and explain - in order to allow the attendances who do not have a computer background to understand the poster - the value of the technologies involved in them. Technologies such as Blockchain, Artificial Intelligence or Virtual reality would be presented in an easy-to-follow manner, so people can see that technology, when used well, can help out a lot!

Machines best friend

Rachel Finlay, *University Of Stirling*

When it comes to pets, many will agree that they are hard to train. It's also a very frustrating and time-consuming process. Dogs for example, need trained in many different areas such as toilet training, barking and basic commands like sit and lie down. On average it takes a young dog 4-5 months of intense training to be fully obedient. Which isn't feasible if the owner has a full-time job. One approach would be to sacrifice some time every day to train your animal! Or we could use technology to help. This is exactly what has inspired and fueled my idea of using robots or manually programmed machines to help train our pets while we're not around. One main example would be how dogs can remember shapes, scents and locations. Using this research, we will be able to create a machine that uses visuals and commands while the owner isn't present to help train them. This would help many areas of pet ownership as an owner is more likely to keep a pet if it is trained thus reducing the number of dogs in pounds while taking away the most stressful factor of pet ownership. There are some manual inputs to this machine such as voice inputs if you want your pet to respond to your voice and not only the automated voice. This machine could pre-record your voice saying a command, then using image recognition it will know if the animal did the right or wrong thing. There are many features this animal training machine could have which my poster will elaborate on.

Data must grow...but securely

Rachel Fitzsimmons, *University of Bath*

My interest in computer science was sparked by a notification on my mobile regarding a security upgrade needed to prevent hackers breaking in to my personal account. This got me thinking about the virtual fight, between the phone's development team, protecting my interests, and hackers who want to access my data for their own purposes. It is apparent that everyone's lives will be increasingly influenced by the data in the cloud and this impact is bound to grow with more and more great ideas and services, which exploit this pool of data, being devised, implemented and released daily. Although many areas of data science derive knowledge from data that we ourselves have knowingly provided - thus allowing us the opportunity to demand security - other areas of the discipline utilise observation and mathematical analysis of our behaviours e.g. reading habits, shopping patterns, social preferences etc. This indirectly acquired information about us, which we as individuals have no chance to review from either a content or security perspective, poses equal security challenges. What is clear is that we are still in the early days of identifying where data mining will take us - the potential for the medical field alone is both significant and exciting - albeit this sector, as much as any, highlights the need for robust data confidentiality and integrity to surround this sensitive information. It is apparent that the field of Cyber Security, with its white-hat and black-hat hackers, its firewalls and malware, is going to be more and more

central to living our lives with the benefits that are coming from this data but without the threats or penalties from the criminal sector.

Can big data save our planet?

Rimma Chepik, *Middlesex University*

Our planet is at risk. The climate is warming too fast. Entire species of animals are disappearing at alarming rates. It might seem like humans have done too much damage, that we're in too deep to be saved, but humans might also be the saving grace of this planet. Technology is making strides every day toward saving endangered species. It's an unlikely pair, technology and animal conservation, but if you look at all the ways people are using technology to protect endangered species, you'll see that technology and animal conservation are moving in the right direction. For years, scientists have been exploring ways to save the vast sheets of ice covering Greenland and Antarctica, which as the climate warms are melting and falling into the ocean. Because the problem of global warming is so large and complex, there is no simple solution. One of the new plans involves protecting vulnerable glaciers with underwater walls built by robots. Made mostly of robot-excavated ocean sediment, the walls would extend from the ocean floor to the base of glaciers' floating ice. Unfortunately, humans often contribute to the dangers animals face every day. Poaching is a particularly troubling problem throughout Africa for the elephant and rhino populations. Numerous organizations have experimented with using drones to catch poachers, and some had success. In my poster, I will share some ideas how we can save the Arctic from Global warming, or how we can save dying species that are fast disappearing because of poachers or "traditional medicine practices", or possibility to save forests from being cut and oceans from being polluted by plastic.

How are our brains different from computers?

Sam Thiesen, *Robert Gordon University*

The Information Processing Metaphor is a framework in cognitive science used to describe and explain mental processes. It is based on the assumption that the information processing happening in the brain resembles that of a computer. On this poster, I aim to explore this underlying assumption by comparing the brain with computer hardware and software. We will look at the physical structure and composition of both the brain and computer which differ in their materials, power consumption and how they transmit information. After that, we will examine how brains and computers differ in the way they take in, process and store information. Computers, for example, are based entirely on the binary system while human senses process information of different formats. And while the same input will always result in the same output in a computer system, using the brain changes its structure which means that outputs for the same input may change throughout time. Also, computers can be shut off and retain all information stored in non-volatile memory while brains cannot be 'turned on'

again after being 'turned off'. At last, we will explore the characteristics that currently distinguish humans from computers such as consciousness and the abilities to feel emotions and reason logically. Additionally, we will take a look at the possible implications if the initial assumption is correct. These include the possibilities of creating conscious artificial intelligence and uploading human consciousness into computers.

Technology and Mental Health: How Technology is Revolutionising the Way Mental Health is Treated

Sarah Lappin, *University of Edinburgh*

In the past decade, as technology has become a bigger part of our lives, there has been significant discussion about the effect of technology on our mental health. Three quarters of British people will face mental health issues in their lifetime, causing mental health services to become overwhelmed by the demand. Technology is often blamed for this due to social media having an adverse effect on mental health. However, specialists are starting to notice the positive impact technology can have on mental health and are quietly revolutionising the way mental health issues are treated. From apps to help track mental health to virtual reality helping patients to get over crippling phobias, tech is beginning to be utilized to tackle the mental health epidemic. In the UK many young people are on waiting lists for mental health services for months before having access to help. In Britain alone, tens of thousands of young people are using a variety of apps to help them cope with mental health issues including depression and anxiety. The immediacy, along with anonymity, provided by counselling apps is a key aspect of their success. Furthermore, University College London are currently testing avatar systems to help patients with Schizophrenia to control the voice of their hallucinations. So far, the system is proving more effective than many pharmaceutical treatments and is reducing the frequency of schizophrenic episodes. In this presentation I will explore the applications of technology in mental health treatment further and discuss the effectiveness of such technologies.

Gendering Artificial Intelligence

Sioned Jones, *University of Edinburgh*

The observation that gender is performative has been credited to many different people, including Alan Turing. In his 1950 paper, "Computing Machinery and Intelligence", he identifies a machine's ability to fool a human into believing it is a woman as a measure of its intelligence. If a sexless machine can convince a human that it is a woman, then surely femininity is a simulation, a collection of traits or accumulation of code, more than an essential identity. The performance of femininity is compared to the performance of intelligence, as we often look for typically feminine characteristics in a truly intelligent machine. We rarely argue that a machine that can do typically masculine, rule-based tasks

such as mathematics is truly intelligent, unless it can also demonstrate the typically feminine characteristics of empathy, emotion and articulation. A machine's intelligence relies on its ability to embody femininity. Is this why we build AI that aims to appear human, to also appear feminine? Personal assistants such as Apple's Siri and Amazon's Alexa are generally gendered female, through their naming, interactions, and the roles they play in our lives. Do we find it easier to relate to and trust female AI? Do the predominantly male teams building these systems find it more natural that a female entity is at their service to perform menial, secretarial tasks? Are we celebrating femininity's link to intelligence, or rather using AI to enforce gender stereotypes?

The Relationship between Technology and Sport

Sophie McFarlane, *Durham University*

There is a wide variety of sports that are all unique in their own way and vary in the skills required, rules and popularity. New tactics are continually being developed and different varieties of strategies are being implemented into pre-game preparation, game tactics and post-game recovery. This is all in the hope that you will get a marginal gain on the opposition. As sport becomes more competitive and teams continue to work at their peak, these marginal gains can be the difference in winning or losing. Technologies are being developed to help the coaches, players and referees to enhance sports and make them more exciting for everyone involved. This poster presents how technology is involved in assisting the coaches, players, referees and spectators. It will also cover two main areas that aren't as obvious, how sport is broadcasted and how technology can aid health and safety. It will also touch on why these technologies have been developed and the impact they have had on the games involved. Sport is not the first topic you think of when you think of technology, yet it is a huge sector that is continuing to grow and having an impact on numerous people.

Convolutional Neural Networks and Artistic Style Analysis

Tanisha Walker, *Nottingham*

Art is unique when created by the human hand - from composition of the piece, to the artistic style. Given any image, a human artist could quickly attempt to visualise and recreate what it would look like to transform the image into a different artistic style, however when given the same task to the computer it is difficult to determine. There is only a finite number of images of specific objects, in specific artistic styles which have previously been combined. A neural network typically learns from the data it is fed so this limitation is crucial. Convolutional neural networks are a combination between deep neural networks and kernel convolutions. They are the most effective known neural network architecture, useful for recognising

objects within images. The convolutional neural network comprises of a large number of layers of convolution (each with different kernels) to identify key features within an image; non-linear filters to allow the network to solve more complex, non-linear images; pooling to disregard any positioning of an object. This will remove all spatial information. The network can be trained by methods such as back propagation. Once trained, it will be able to identify content in an image and the style of an image separately by seeking combinations and patterns between key features in the image. Feeding source images of an art style and multiple objects into a convolutional neural network will produce an accurate recreation of the image in the given art style.

Combating cybersickness in VR dementia care

Venla Kamppari, *Durham University*

Virtual reality (VR) technology can offer multiple benefits to aging dementia sufferers. It is being used as a tool to connect with patients lost in the fog of declining memory and mobility, and ease some of the symptoms. VR has proven an effective distraction technique during states of mental confusion and agitation typical in dementia patients, and has been used in reminiscence therapy to help in maintaining memory functions. All of the benefits VR can offer for dementia patients, however, end up being inaccessible if the patients are not able to comfortably use the technology. The main sufferers of dementia, the elderly and women, have been shown to suffer from cybersickness more than the average person. Although the evidence for performance decrements due to cybersickness is limited, research does suggest that it is a major barrier to using VR effectively in dementia care. Combating cybersickness starts from addressing the discomfort patients may experience, but also has to look into inadvertently caused psychological issues, such as reality dissonance and further regression in time distortion. Some of the factors contributing to cybersickness are postural stability, flicker fusion frequency threshold and the eyesight of the individual. Reducing the negative effects of the aforementioned involves techniques such as introducing a static frame of reference, simulating ways of displacement not creating or reducing discrepancies between the visual aspects and body movement, and dynamically reducing the field of view.

Machine Learning Can Help Us Discover New Indicators for Suicide.

Zulia Shavaeva, *Durham University*

Have you ever met or heard about anyone who committed suicide? According to the World Health Organization over 800,000 people die due to suicide each year and the number of people who attempt suicide is much higher. Have you ever thought what would have happened if that person had gotten help at their lowest if there was something that would give clues to their parents or friends that there is something profoundly wrong that would cause them to end their lives? Well, machine learning might be an answer to this. My research aims to utilise existing Sentiment analysis of twitter feeds in an attempt to pinpoint the causes of suicide using the machine learning algorithm t-SNE for data visualisation based on nonlinear dimensionality reduction. When you imagine someone is thinking about ending their life you would expect them to 'tweet' posts like: 'I am depressed and upset.' 'I like cats, but recently they bite me'. The Last tweet might not make sense for a human as a link to suicide but using machine learning we can uncover layers of sadness, anger in the last tweet by running "Sentiment analysis" on the data to categorise it. A next step would be to run a t-SNE a machine learning algorithm for visualization to group causes linked to suicide and visualise them. As a result by applying nonlinear dimensionality reduction on an already classified dataset and feeding in the real tweets may uncover new causing factors linked to suicide.

FINAL YEAR STUDENTS

Can an algorithm decide who deserves an organ transplant?

Courtney Gwynne, *University of Wolverhampton*

There are multiple methods used worldwide to aid the decision of who receives a donated organ, but which method favours the most-deserving candidate? Can computer algorithms based on data make better, more objective choices? Current methodologies include using a 'local' transplant centre or MELD/PELD (model/paediatric end-stage liver disease). Also applicable is the QALY measure (quality-adjusted life year). Various factors are considered: organ type, tissue type, the geographical location, capacity to benefit, paediatric status, the criticality and previous wait period; the considerations could be endless. Improved methodologies are being developed currently. One such method, recently introduced in the UK, is the Transplant Benefit Score (TBS) which compares the candidates based on the positive difference, or benefit, it will have on their lives. Of course, no method is 100% free of human input. As social beings we are likely to include factors such as family, responsibilities and career. These may be right or wrong, but there is no-one to say for sure. So how in the future can we find algorithms that best reflect our values? In the nearby future there may be a more general support. Several associations are campaigning for the "opt-out" method of donating. This could aid the responsibility of the decision maker by increasing the supply of organs to begin with and ultimately, reduce the dilemma of the current state. This study will explore these issues.

An assessment of interactive environment designed to increase the users' emotional response of fear virtual reality (VR).

Danielle Harris, *Robert Gordon University*

This research project aims to measure users' fear response to different aspects of a zombie/horror game and whether playing in virtual reality increases this fear response in comparison to regular screens. A Virtual Reality capable game is currently being developed, with a post-apocalyptic aesthetic. Using Unity game development software, this game will be developed all together with two different outputs (VR capable, and regular PC game). Along with the aesthetic, there will be an appropriate ambient soundtrack to heighten the player's tension in the lead up to pivotal moments in the game. In recent years the increase in

popularity of horror and zombie games has been exponential. The growth in this genre has also seen a rise in games trying to scare users more, with each newly released game being even more terrifying than the last. The project proposed here aims to really delve into what increases a user's emotional response to fear and what makes a horror game fun without being traumatising. To help achieve that, surveys are being used at each step to gauge the interests of the players, and their thoughts on progress so far. To test the theory posed in this research question, there will be two test groups (one for VR and the other for regular screens) each player's reactions will be recorded and compared. The players will be filmed while playing the game to monitor their physical and verbal responses, with fitness bands to monitor their heart rate.

Age-Detecting Facial Recognition for Online Video Games with Age-Restriction

Dina Tesfay, *University of Greenwich*

The amount of under-aged children that play online video games with age-restriction is outrageous. Countless online data sources and scientific papers advocated that there are clear links between violent video games, that children play resulting in violence behaviour. Here will be a research in ways age could be detected through facial recognition, to decrease the number of children gaining access through providing fake date-of-birth.

Password policies and where to find them

Eleanor Wardman, *Sheffield Hallam University*

Electronic passwords have been around for over 50 years. The idea was first introduced in 1960 by Fernando Corbat whilst he was working at Massachusetts Institute of Technology (MIT). Passwords have since gone on to become a large part of people's lives with business employees having to manage around 191 password protected accounts on average according to a report from LastPass in 2017. Organisations themselves have a number of mandatory documents in place, including numerous policies in order to comply with the security framework they choose, be it NIST or ISO27001. One of the mandatory documents is the Access Control Policy. Within this document, an organisation can set out the complexity rules for users' passwords or have this as a separate policy. However there is limited information on how to compose the policy within the frameworks. This leads us to pose the question of what the best practices are to comply with the framework and promote security. By comparing two of the most popular frameworks, some of the legislation relating to password management and various studies on adequate password complexity, this poster will attempt to recommend a set of rules for organisations to use in their own password policies.

Cryptographic hash functions - A journey to the heart of modern day secrecy

Elouise Foster, *University of Wolverhampton*

The story of how thousands of men and women worked around the clock to break the enigma code World War 2 is well known. Their work shaved years from World War 2 saving countless lives. The cryptographic methods used were advanced for their time and the fundamental principles are still applied in current encryption techniques such as MD5, SHA-3 and Whirlpool. However, the mathematical Hash functions which underlie them are not widely known or understood. Hash functions must be specially crafted to have strong collision resistance while being computationally efficient. As information security enables our modern digital lives, it is important that we understand how to keep our data secure to manage its integrity and our privacy. Several approaches now exist each with their own strengths and vulnerabilities. With vast communities of malicious actors looking to compromise them, these algorithms must constantly evolve. This poster will explore the development of cryptographic hash functions throughout history, the current state of the art and suggest the possible future directions for the field.

Ada: natural language search to support applicants for the University of Bath

Emma James, *University of Bath*

This project will implement a chatbot called Ada (Applicant Dialogue Assistant) as a type of personalised search engine for applicants to the University of Bath. A chatbot is an automated program that will interact with students using natural language to facilitate engagement. A student can ask questions about the university and obtain information immediately as Ada is programmed to understand these questions, provide answers, and execute tasks. I will then go on to evaluate Ada and the use of chatbots as an alternative to already available resources.

Using Machine Learning to Predict Student's Learning Success in the SOB Monitor

Evelina Smitait, *Middlesex University*

Using Machine Learning to Predict Student's Learning Success in the SOB Monitor The SOB Monitor is a successful educational tool created and used by a number of modules in Middlesex University to keep a record of student SOB's. SOB's, otherwise known as Student

Observable Behaviours, are a sequence of challenges, mini projects, examples and case studies, that offer a unique approach to planning curriculum and assessing students' performance which is measured by the amount of completed SOBs. SOBs are usually observed in the class by lecturers. A student needs to obtain a number of these (the number varies from module to module) in order to pass the module. With the help of SOBs, students and teachers can know what skills they've gained during their time of study and which parts require extra attention. Using machine learning this educational tool could be taken even further by implementing extra functionality for predicting which SOBs the student might find more challenging. Predicting student's performance on SOB Monitor could offer many benefits, including:

- * A clear vision of what topics might need extra attention in the future.
- * Help planning and to individualize study sessions.
- * Improved academical results.

My poster will present my approach to building a predictive model to classify SOBs into their respective levels of difficulty.

Crime in London: Analysing big data sets

Felisters N Otiso, *University of Greenwich*

It is well known that crime is a huge concern in London, and it is a quite recurrent issue. Surprisingly, general public opinion on crime rates is often lower than it actually is. Judgement is often based on that voiced in the media or circulated through word of mouth. Statistics carried by the police nonetheless shows that the crime is in fact higher than most expectations and often conflicts with what is heard in the media. Advanced data analytics tools can be utilised effectively to analyse this big data that will be of benefit to the public as well as the police. By doing so it will be easy to identify the demographics of crime per borough, what types of crimes are happening, who are the victims as well who are the perpetrators and much more. The poster will present and visualise the results of the analytics through a dynamic dashboard. Open source datasets from reliable sources are used and have been verified by competent bodies. For example, the government website where they keep most of the criminal records that are taking place in London. The dashboard will also allow for the selection of dynamic variables or indicators. By doing this it will be easy to provide an insight to the general public as to local authorities and businesses as to which borough have more crime rates than others and subsequently for them to undertake smarter decisions.

Can Sentiment Analysis Help Improve Policing?

Grace Taiwo, *Keele University*

Public attitudes towards the Police have been studied broadly by scholars for years - with it being a category in the Crime Survey for England and Wales (CSEW) (Rotenberg, 2018). According to the CSEW (2018) 78% of the public are confident in their local police. This confidence has risen over the years; however Nick Hurds - the Policing Minister, has warned that this may start to drop as they are allegedly failing in the investigation of crimes (Hymas ,2018). The way the police perceive their community may have an effect on the way the community acts and feels towards the police. As if the police have negative views on their communities, the community may feel secure in adopting the negative labels as studied by David Matza (1969). This in contrast, has not been researched to the same extent as the research into our trust in the police. When looking at opinions of a group, sentiment analysis is frequently used for natural language processing. This analysis has been used to gauge the views of customers in fields ranging from medicine to customer service. With a local policing presence on micro-blogging platforms like twitter, it has become easier to follow the police and their views (Pak et al, 2010). The aim of this project is to develop code to collect and analyse tweets from a list of Police officers, and look at how this may affect the regions they police.

Code as Old as Time

Hannah Bellamy, *Durham University*

Now more than ever, encryption is the backbone of cybersecurity, and an essential cornerstone of any major computer science project. However, the act of protecting and conveying secret information is by no means a new one; cryptography has existed since ancient times. From ancient Egypt and Mesopotamia through the Renaissance and World War II, code makers, and breakers, have been writing history. The world of cryptography is a never ending cycle of cryptographers creating new ways to encode data information, which code breakers figuring out how to crack the cipher. While present-day cryptography often relies on the generation and hashing of large primes, historical cryptograph relied on much less glamorous methods, such as writing on a slave's shaved head and waiting for their hair to grow back, or layering wax of the message. This poster will dive into the rich history of cryptography, sharing stories and techniques from the past and present to pull back the curtain on one of societies' oldest past times: sharing secrets.

An Algorithm To Compute The Generators Of A Tropical Linear Prevariety

Hollie Baker, *University of Bath*

Editors note: this abstract includes LaTeX code which has been converted to images / special characters but also included as code, for accessibility reasons.

An Algorithm To Compute the Generators of a Tropical Linear Prevariety Tropical mathematics is an exciting and active area of research. It is centered around the tropical semiring,

$(\mathbb{R} \cup \{-\infty\}, \oplus, \odot)$.

$(\mathbb{R} \cup \{\infty\}, \oplus, \odot)$

The real numbers are extended by infinity, and equipped with two operations: tropical addition, \oplus , and tropical multiplication, \odot . Tropical addition is classical minimum, and tropical multiplication is classical addition. Based on this foundation, the study of tropical mathematics aims to build up analogies of fundamental concepts in classical mathematics. One such fundamental relation in classical linear algebra is that of the hull, or span, of a set of vectors. The equivalent definition in tropical mathematics is the tropical hull. Just as a linear variety can be expressed as the span of it's basis vectors in classical linear algebra, a tropical linear prevariety can be expressed as the tropical hull of a set of vectors, called it's generators. Furthermore, it was proved by Butkovic & Hedge's (1984), and constructively by Gaubert & Katz (2011), that every tropical linear prevariety has a finite set of generators. An algorithm for finding the basis vectors which make up the linear hull exists, and implementations are widely available, for example, in mathematical packages like MATLAB, However such an algorithm for finding the generators of a tropical linear prevariety has not yet been published, and no implementations are currently available. This project aims to design and implement such an algorithm, based on the work by Vorobjov and Grigoriev, who also developed a constructive proof that every tropical linear prevariety is finitely generated.

The development of a low powered radio frequency device "Crazyradio", to send and receive data packets between a computer and unencrypted wireless keyboards and mice.

Jacqueline Hollyoak, *Staffordshire University*

I have had the ability to intercept and capture transmitting data packets travelling between a computer Nano receiver and an unencrypted wireless keyboard or mouse. I use a RF (Radio Frequency) device called CrazyRadio PA with RF antenna. These devices are normally used in drones as they have a long-range radio frequency capability. I have re-programmed and installed appropriate firmware, which transformed the CrazyRadio PA RF device into scanning data packets successfully between the suspects computer Nano and the wireless keyboard. Along with virtual machines I can intercept the data packets, onto the virtual machine. I have written a script which will allow me to send a file to the suspects desk top on their computer through their command line function. The file I send through the command line will upload in 1000th of a millisecond. If you blink it will have loaded and disappear that quickly. I can control the suspects computer through their command line, having remote access to details such as credit card numbers, passwords, messages, emails, photos and so on without gaining physical access to the suspect's computer and remaining undiscovered, leaving no digital trail. I don't have any physical access to the suspects computer. I have tested the CrazyRadio from a distance approx 100 meters away in another part of a building. This device will work through walls, so no line of sight is required.

Making IT good for Humanities students: using low-code tools to develop a customisable reference manager.

Jennifer Gane, *Northumbria University*

Over the past eight years digital reference managers such as EndNote have revolutionised how academics and research students manage their bibliographic records and generate their reference lists. However, despite software tools becoming increasingly sophisticated, students use of them is often limited, particularly in humanities subjects. Melles and Unsworth (2015) argue that those purchasing licences for reference managers for academic use should pay closer attention to the needs of students rather than the functionality of the software and present the managers 'not as a complete package but as a set of possible features or tools that researchers could draw on as required to meet changing needs.' At the same time, the introduction of Rapid Application Development tools is changing the face of

software development, enabling apps and systems to be built quickly and iteratively, often by citizen developers with limited knowledge of programming language. Successful 'low-code' offerings enable inexperienced developers to create systems using straightforward drag-and-drop functionality which allows apps to be built by non-professionals to meet a particular set of business needs. This poster will explore a project which aims to provide humanities students with a bespoke Rapid Application Development tool so that they can create their own bibliographic reference manager which meets their individual needs. Not only does this project offer a solution to the problem identified by Melles and Unsworth, but also encourages a traditionally non-technical area of academia to engage with the digital space in a productive and helpful way, thereby going some way to breaking down barriers between technology and the humanities.

Assembling robot in Augmented Reality (AR).

Julia Gabajova, *Middlesex University*

All of us, have evolved to think and store memory in three dimensions. In fact, when we look at information on a flat piece of paper on a computer screen or just a simple paper handout, it will take some time for the brain to translate that back into the 3D scene, for us to use it. There could be a number of solutions to this specific problem, but I believe the best solution is to use AR to enhance learning. In this poster, I will give a brief overview of how Augmented Reality is used in education and how AR is changing the whole working process to their inability to focus way more, than just reading the simple paper handouts by visualising how things are actually done. Further, I am going to provide an example that I have created, using this advanced technology, to help anyone interested in assembling the MIRTO robot. The MIRTO robot is a robot that is primarily used for teaching first year Computer Science undergraduate students at Middlesex University. Rather than put a student with paper handout instructions of different components of the robot, the students will be able follow the instructions through their own devices and Google cardboard headsets.

Creating a dashboard-style interface for clinicians to get access to results from Cognitive Assessment to detect dementia

Katie Walker, *University of Sheffield*

Dementia is an increasing problem in Britain with more than 850,000 currently diagnosed and many who are yet to be diagnosed. For example, In Sheffield, there is approximately a three month waiting period for a one hour appointment at a memory clinic. One reason many go undiagnosed is due to long waiting times for memory clinics to receive a diagnosis.

Detecting the symptoms of dementia and giving diagnosis currently requires an expert in neuropsychology to speak with and analyse a patient for around an hour to provide a diagnosis. However, early signs of dementia can be often detected by subtle changes to speech and language. For example, a patient may take time longer answering questions, provide shorter answers to questions regarding their memory or use many filler words. The aim of the project is to develop a dashboard style interface that takes recorded answers from a patient and displays the results in a clear and concise way so that they can be easily understood by a clinician who can use them to make an accurate diagnosis quickly, without initially the need to meet with the patient in person. This method of assessment means that those that appear low risk may not need to attend the clinic, leaving more appointments for those that are high risk and would benefit from quick treatment.

Blank Is The New Exciting

Kristen Rebello, *Middlesex University London*

Imagine this. Classroom setting. The class, dimly lit for a lesson that's going on. Boring. Bland. Barren. Students half fallen asleep. The other half clinging onto hope that it's going to get interesting. Most of the time it never does. Think about it. What would make a class more interesting? Learning about the prehistoric times, for example. Would you like to read about it on slides, while a teacher stands and talks in front? Or would it be more exciting to have actual dinosaurs in the class? Visualizing is a very important part of any industry, and Augmented Reality is all about making things visual and allowing users to see them from all angles. It's innovative and captivating, especially when you get to see what an almost blank paper and a device can do. What are the boundaries of AR? How far have we come in implementing it? Academic or business presentations, advertisements, maybe even CVs and Social Media profiles can be made more attracting just by adding this technical touch. This poster is going to look at Augmented Reality in not only an academic setting, but any presentation scene, and show exactly how AR can be a major influence in future advances.

Human / Technology Convergence: Are Human Microchip Implants the start of our next evolutionary stage?

Laura Atkin, *Northumbria University*

Human Microchip Implants are an advancing sector of data technology. These implants could have purposes such as providing building access, retrieving contact information, booking travel tickets, contactless payments and even tracking health. Today's society has technology so ingrained in daily life that these microchip additions would not seem out of place, but would simply begin a merging of the organic with technology to increase ease of life. With a lot of interest in computing being the desire to place human traits into Artificial

Intelligence (AI) and robotics, focusing on the development of these implants - the exact opposite - could eliminate the need for sentient technology advancement altogether, securing the hierarchy position currently held by humans in society. Features these implants could install in humans would put us on par with an AI being's level of self awareness, and improve our error handling abilities, which when tied to the health-tracking aspect of implants could drastically advance the medical diagnosis process. The possible advancements of these implants could enhance global living standards, allow us to adapt to world progress, and improve our own physical development - the very characteristics featured in the definition of evolution. However, realistically, to become humanity's next evolutionary stage, social and ethical concerns would need to be addressed. These include cyber security to prevent hacking/tampering, in addition to an overhaul of the non-wireless technology systems currently in place. This work will strive to answer the question: are these implants the next natural progression of the human race?

Cyber Resilience: Engineering a Secure Future

Marie-Daniele Fofana, *University of Wolverhampton*

Most experts agree that when it comes to cyber-attacks on computer systems it is a question of "When" rather than "If" they will occur. Trillions of dollars' worth of damage is caused globally by cyber-attacks every year. In the current cyber threat landscape it is no longer sufficient to simply guard against attacks, system designers must engineer ways to survive attacks and limit their impact as much as possible. This requires the use of new methods and approaches in design known as "Cyber resilience". Risks and vulnerabilities must be identified, strategies for protection determined and where possible deploy an appropriate response. The examples of those might include use of redundant components, and failover strategies for business continuity. It may also include techniques for detecting when a specific attack is underway in order to deploy active countermeasures. This study will explore the key concepts of Cyber Resilience and discuss situations where they may be best applied.

Hyperparameter Optimization of Spike Detection and Sorting Algorithms

Mariyana Cholakova, *University of Edinburgh*

Monitoring the activity of neurons is the basis for understanding the brain mechanisms. High-density microelectrode arrays integrate thousands of electrodes in a confined spatial setting, providing data for hundreds of neurons. The algorithms used to analyse the data, namely spike sorting, must be reliable and computationally efficient as they comprise one of the most important tools for contemporary neuroscience. Currently, precise manual curation is required to adjust the parameters and validate the accuracy of the algorithms, namely the

correct detection and sorting of spikes. Due to the complex nature of the data, parameter tuning is not a trivial task and validation of the results becomes infeasible. Automization of the procedure is essential to exploit the potential of all this data. We develop a successful method for hyperparameter optimization of spike detection and sorting algorithms. It is a crucial step towards automizing the pipeline for analysis of large scale electrode array recordings. We apply Sequential Model-Based optimization technique, a formalization of Bayesian optimization, that takes into account the complexity of both the algorithms and the hyperparameters space. Considering the information from all previous evaluations It elegantly solves the dilemma between exploration and exploitation when searching for optimal parameter configuration. With significantly less number of iterations compared to random and manual search, this approach improves the performance of the algorithm which we validate against synthetically generated ground truth data.

Optimisation of crew rostering in public bus transport

Minka Valkova, *University of Greenwich*

In public transportation and mainly public bus transportation, the majority of spending goes towards human resources and improving processes. Companies are trying to reduce their spending by looking at technological innovations to optimize crew scheduling and crew rostering methods. The better allocation of human resources can reduce the operational cost as well as increase driver satisfaction. The optimisation problem for crew scheduling has been a popular topic over the years and is usually divided into two sequential problems- crew scheduling and crew rostering. Crew scheduling is the process of creating anonymous duties. Crew rostering looks at the allocation of the duties to actual people in the most efficient way. An optimal roster is considered to be the one that has minimal difference of the overtime between all drivers and number of unassigned duties as well as maximal satisfaction for the drivers. In order for the duties to be assigned to the crew, certain constraints need to be satisfied. Some of these constraints are working regulations others are specific to each company. Overtime, spare, special arrangements, maximum consecutive working and days off are part of the constraints that are taken into account before assigning the duties. A suitable solution is a two multi - commodity network flows with cyclic days off pattern. A decompose-and-fix heuristic is used in the solution and is based on sequentially solving the sub-problems, while bounding or fixing the values of some variables to integrate previous decisions. The poster will discuss best optimisation algorithms and present a proprietary scheduling system using sample data from a real-life company. The aim of the system is to help with the duty rostering process, save time and operational resources.

Using Big Data and Predictive Analysis in the Retail Sector

Oladunn Ajayi, *University of Wolverhampton*

The retail sector is faced with a dynamic and competitive environment with competition increasing through business mergers and acquisitions. Many retailers are now seeking to better manage their customer relations by collecting and storing relevant data. A huge number of transactions occur every day, with peak events around holidays, like Christmas, or sale days, like Black Friday. These events often push the hardware to the limits and the useful data into the realm of 'Big Data' which is potentially useful but challenging to work with effectively. Due to the sheer volume of this, a special range of techniques are being used to uncover new statistical patterns so that Retailers can make decisions and predictions based on these insights. This poster will review the use of big data techniques in the retail industry including data mining, artificial intelligence, machine learning, data visualization and predictive analysis.

DNA heritage augmented reality visualisation to challenge the concept of race and identity

Rachele Cavina, *Edinburgh Napier University*

Being able to explore and analyse human's origins with a scientific proof fully remodels the concept of ethnicity and race. DNA heritage testing is becoming more and more popular; companies such as 23andMe and ancestry.com have thousands of people buying DNA kits to find their ancestors: users pay for receiving the kit, spit inside a small tube, and then send the box back. After a month the company sends the results via a link accessible with a personal password. The users are then able to see the zones and percentages of their ancestors' history on a world map. The analysis of DNA heritage as a social knowledge can lead to a new concept of race and identity. This project is looking at how to realise an easily accessible way for individuals to have a 360° experience of their DNA heritage test results. All science involves storytelling in some way, in this case DNA heritage blends into personal identity and family narratives. The combination of science, technology and sociology, leads this project to the design of a personal user experience with the use of augmented reality (AR). Humans all originated in Africa and their spreading around the world determined different skin colours and cultures. The visualisation of a scientifically proved history tailored to different people could really have an impact on society.

Computer Science != IT : teaching Computer Science principles without the use of technology to primary school students.

Sarah MacNeill, *University of St Andrews*

Despite a growing industry, the percentage of University students pursuing Computer Science-related degrees has declined over the past 3 decades, with women particularly under-represented (Milesi, Perez-Felkner, Brown & Schneider, 2017). Some factors impacting this are the negative image often associated with programmers, and a general misunderstanding of what Computer Science is. It's important to expose children to the subject from a young age to dispel stereotypes and increase awareness, however this is difficult to implement, particularly in schools with limited resources. During a placement in a local primary school, I noticed that both teachers and students believed Computer Science and IT were synonymous. Despite some of the children having used Scratch before, there was a misunderstanding of what Computer Science was, a lack of enthusiasm for the subject, and students who weren't technologically literate struggled to participate. Furthermore, limited resources meant that children had to share their computer time between two or three. In an attempt to tackle these issues, I planned and taught a number of Computer Science lessons that required no use of technology, based on previous work by Bell, Freeman & Grimley (2009). I prepared co-operative, active lessons focused on computational thinking that the whole class could get involved with. Topics taught included algorithm analysis, best- and worst-case time complexity, optimisation and the real-world applications of algorithms. Not only did the children (regardless of gender) enjoy these lessons; by abstracting away from coding, they were able to understand concepts usually taught at University level.

- Milesi, C., Perez-Felkner, L., Brown, K., & Schneider, B. (2017). Engagement, Persistence, and Gender in Computer Science: Results of a Smartphone ESM Study. *Frontiers in psychology*, 602. doi:10.3389/fpsyg.2017.00602
- Bell, T., Alexander, J., Freeman, I., & Grimley, M. (2009). Computer science unplugged: School students doing real computing without computers. *The New Zealand Journal of Applied Computing and Information Technology*, 13(1), 20-29.

Design principles for gestural input: learning lessons from British Sign Language (BSL)

Sophie O'Donnell, *University of Bath*

This poster will examine how concepts from BSL can be applied to compiling a gesture set for high-level computer tasks. Gestural interaction is exceeding the boundaries of traditional mouse and keyboard-based tools. This emerging paradigm of hand movements and facial

expressions has the potential to constitute a richer interaction modality. As we head into the post-WIMP era with more interaction capabilities available, these are diffusing rapidly into the market, especially with gaming and smartphones. In this work, we explore the use of concepts from BSL to design a gesture set for Human-Computer Interaction (HCI). We consider a wide range of users, including those with a hearing impairment, throughout the design stages. This is key to increasing accessibility in a fundamental way, not just through an add-on after implementation. We specifically focus on dynamic two-handed gestures inline with BSL. Through user studies comprising suitability testing of constructed gesture sets against the task they are aligned with, comparing a BSL gesture set against a general set. Results show a considerable preference for BSL gestures, and little relation between participant's age and ranking of gesture suitability. We use the results and insights from the study relating to the effects of those designing the gestures, as well as the cognitive, articulatory and technological aspects, to propose a new framework for gesture design principles. Future work will introduce user-composed gestures and exploring ease of recall. The use of Machine Learning with the potential for personalised gestures will be an exciting area of expansion.

An introduction to Sequent Calculus

Yvett Szilagyi, *Swansea University*

The field of logic has three main areas: mathematical, computer science and philosophical. The project will focus on the interface in mathematical and computer science sectors of logic. Using proof calculi is important in order to understand more about the connection between the logic of mathematics and computer science. The knowledge of logic is crucial to be able to communicate with the computers. It is an affiliation between humans and computers, thus it is an essential task of computer scientist to learn during their academic studies. The poster's topic is based on Sequent Calculus, a proof calculus implemented in Haskell to create an interactive theorem proving program in first-order logic (propositional logic). The rules of Sequent Calculus will be introduced, and the software will be completed to show how Sequent Calculus works in action. Proof calculi are important in Computer science for extracting proof trees from proof objects by which we can get effective algorithms, this process is called program extraction and it is an important research topic in postgraduate studies.

MASTERS STUDENTS

Travelling Salesman Problem Solution Using Distributed System

Alena Polchov, *University of Portsmouth*

The Travelling Salesman Problem (TSP) is an NP-complete graph problem where the shortest path containing each vertex exactly once is found. This paper implements and analyzes a modification of the Christofides' algorithm (1976) for the TSP that is adapted for a distributed system, designed by Dinh and Chien (2015), who defined an algorithm for parallel systems. Theoretical complexity of this solution is $O(n^2 / k + n \log k)$, where k is the number of threads used. With the assumption that each vertex is one thread the algorithm finds the shortest path connecting all the vertices. This is useful in a situation where the collection of data from each node is needed, in the network where the shortest time is the priority. The aim is to find the optimal number of threads, together with how the number of vertices influence the time taken to run the algorithm. Initially, all vertices were used for computing partial results to compare runtime for various numbers of threads (1 to n). A Java simulation was implemented with the results measured by Java system nanotime. The use of caching lowers the amount of data being transmitted between nodes. Results concur with Dinh and Chien (2015), in that a small number of additional systems speed up algorithm significantly. However, it is not useful to use all the vertices, since the overhead for processing large numbers of threads impede the advantage of distributing the computation.

In what ways can computers be produced sustainably?

Alice Arnold, *Sheffield Hallam University*

Technology is playing an increasingly important part in our daily lives. In the western world, the majority of people have some sort of computer, whether it is in the form of a smart phone, a tablet, a laptop or another computer related device. These devices have transformed our lives in many incredible ways, but at what cost to our environment? Valuable resources are used in the production of computers and millions of these devices are produced every year. New, updated models of computers and phones are released frequently and these are bought to replace older models. Often older models that are still fully operational. Do these newer models significantly improve our quality of life? Or are these devices released purely for profit and what cost does this systematic consumption of tech have on the environment? In the light of the UN's recent stark warning regarding the limited time we have to avoid the impact of catastrophic climate change, the aim of this poster is to explore sustainable ways of producing technology. It will look at existing methods

that are used to create sustainable and ethical technology and also how these methods could be exploited further to help reduce the carbon foot print of computational devices.

The World in Fairy Tails

Alisa Pavel, *University of Edinburgh*

Complex social structures, evolving characters and interaction with different places and objects can make fictional stories a pleasant escape from reality. While there is multiple research available on how to evaluate social networks in literature, there is, to my knowledge, none available, that identifies importance of characters, objects and places occurring in literature (here referred to as "extended social network"). Algorithms such as PageRank and HITS were created to identify importance of web pages but can show insufficient performance when applied to social networks and compared with a human based classification. A novel algorithm, inspired by PageRank, is proposed to enhance the performance on social networks in literature. By combining this algorithm with sentiment analysis, it is possible to identify main characters and corresponding villains as well as an importance ranking of different characters, objects and places. The literature used for the construction of the extended social network is extracted from "GRIMMS' FAIRY TALES" by Wilhelm and Jacob Grimm and its results are validated through human based annotation. The proposed method shows, that it is possible to infer most of a reader's feelings and associations about occurring characters, places and objects, more accurate (when compared to a human based ranking) than existing network analysis methods.

Smart receipt and warranties

Amrita Malviya, *University of Greenwich*

Currently in the retail sector whenever there is a financial transaction a receipt is issued, which can be used by the consumer or by the retailer as a proof of purchase. Sometimes along with some of the items there is added paperwork of warranties and the onus is on the consumer to maintain the paperwork for the entire length of the warranty period. This creates significant amount of paperwork to be maintained for years. In order to move towards the greener technology, an Ethereum Blockchain based, on-demand solution is proposed. This solution will integrate directly with the Point Of Sales system and create smart contracts based on the credit/debit card used to make the purchase. This contract will serve as "Proof Of Claim" ready to be made available to the retailer or the customer. It will help customers to access the receipts or the warranty on demand via the Smartphone app or web site and retailers with the regulatory requirements of data storage and seamless solution for their customers, where the e-receipt is always issued. This proposed system would take away the question "Do you need a receipt?", as receipt is always issued without any details being asked.

'Deep Fake' Technology - Is Seeing Believing?

Amy Richards, *Aberystwyth University*

Deepfake is a blend of 'deep learning' and 'fake' and is an AI-based human image synthesis technique which has seen a sharp increase in popularity over the last year. Deepfake technology uses a machine learning technique called a "generative adversarial network (GAN)" to superimpose existing images and videos onto source images or videos. Two machine learning models are used to create a believable deepfake. One machine learning model trains on a data set and then creates video forgeries, while the other attempts to detect the forgeries. At the core of deep fake technology is an autoencoder, a deep neural network that learns how to take an input, compress it down into a small representation or encoding, and then to regenerate the original input from this encoding. A basic human tendency is to seek out information that supports what we want to believe and ignore the rest - deepfake technology exploits this tendency and is another step up on disinformation, known as 'fake news'. Dangers of deepfake technology include harassing innocents, propagating fake news, and hurting the credibility of video evidence forever. Sinister uses including posting a deepfake of an emergency alert warning that an attack is imminent or disrupt an election by posting a deepfake video compromising one of the candidates by putting words into their mouths. Face swapping has been done in films for years but it required skilled video editors and CGI experts spending many hours to achieve decent results. By now, anybody can create a deepfake video if they have a big enough training set of data and a powerful enough graphics processing unit.

Improving Hate Speech Classification Systems with Community Detection

Ashe Magalhaes, *University of Edinburgh*

This research considers the topic of hate speech classification systems which handle types of hate speech and context on social media platforms. This task is critical because recent research has demonstrated the ability of online hate speech to propagate real-life violent crime against refugees and other vulnerable populations. This research addresses the sociological background of online hate speech, the difficulty with defining hate speech, the challenges associated with annotating datasets, baseline approaches to implementing online hate speech detection systems, and the state-of-the-art deep learning approaches to such systems. It finds that the use of community detection in features improves model performance and that leveraging data from fringe social media platform Gab, which contains 2.4x the amount of hate speech than Twitter, mitigates issues around sparsity in datasets and annotations. This research concludes by exploring pseudo-labeling data augmentation methods.

An Aid tracking System.

Barbara Aryeley Aryee, *University of Stirling*

In the world we live today there are many NGOs, Charities and Foundations set up to help tackle some of the world's most pressing and difficult issues and help countries achieve their Sustainable Developmental Goals. These organizations encounter problems of their own while helping to solve the world's most difficult issues. One of the main issues faced by these organizations is gaining and maintaining the support of the public and getting donations, raising funds and ensuring transparency in how funds are being spent. This is as a result of the prevalence of cases about corruption and financial inefficiencies of these organizations. Also donors want their funds to be spent on intended projects only and not cater for administration and staffing costs. The use of blockchain technologies can help alleviate any doubts that deter people from donating and also encourage others to donate. Blockchain is a new technology and can provide transparency and traceability of funds. Blockchain coupled with data analytics and IOT devices can go a long way in helping the humanitarian works of these organizations. The use of these technologies will lead to accountability and transparency which will increase the confidence in the capabilities of NGOs. The aim of this project is to come up with a public platform that allows donors to trace how their funds were spent, allow NGOs to crowd source funds from the public and other organizations into the same wallet by giving them a unique ID while ensuring that the specific needs of these organizations are being met.

Why is Web Accessibility so Important?!

Dima Bsata, *Birkbeck University of London*

Everyone regardless of their abilities, age, culture, location, or system should be able to access the web easily without any barriers or discrimination. There are more than 13 million people with disabilities inside the UK only which is approximately fifth of UK population. Web Content Accessibility Guidelines (WCAG 2.1) which have been defined by World Wide Web Consortium (W3C) as international web Standard providing recommendation and guidelines for web developer to make the web more perceivable, operable, understandable, and robust by everyone and on everywhere. For example, adding simple tools to the website such as allowing screen magnifiers, audio transcripts and alternative text for images will make a huge impact for those people with special needs. Web accessibility standards-compliance will not only help avoiding the Equality Act 2010 Breach but will also improve user experience in a very positive way and will drive more traffic to the website. This study will discuss these standards along with reviewing the UK new regulations and requirements on the web accessibility that came into force in September 2018 especially for government websites as a recent study showed that around 40% of UK local councils' websites failed basic accessibility tests. This paper will present comparative study on some state-of-art evaluation tools and techniques and prove its effectiveness in improving web accessibility.

This study will also provide a comprehensive review on evaluation tools and techniques that help detecting any accessibility issues or barriers within the website.

Comparative analysis of Machine Learning to predict air pollution

Gloria Meneses-Portilla, *University of Greenwich*

The quality of air is severely affected due to the industrial activities, transportation, electricity fuel use etc. For these reason, monitoring air quality has become an essential activity in big urban centers and developing smart cities. The intention of the research is to show how machine learning can facilitate the prediction of air quality in cities using different models, environmental variables like wind direction and humidity and measures of dangerous pollution particles concentration like PM2.5, PM10, O3 and others. The models presented can predict pollution concentration on an hourly basis based on previous meteorological information for a 24 hours prediction using London datastore and European environment agency datasets to forecast in London, UK and the citizens initiative Canairo project dataset to forecast air pollution in Bogotá, Colombia. The aim of this research is to analyze the air quality of both cities using various machine learning techniques in order to compare the results obtained from both urban centers as they have similar population but different method of data collection and pollution emission sources. The poster will detail the mechanisms implemented for prediction and validate the results obtained. Furthermore, it could shed light on the difficulties the cities will face for the future air quality improvement

IMAGINE THE TRUST: THE BLOCKCHAIN R(EVOLUTION) IN FINANCIAL SERVICES

Guneet Kaur, *University of Stirling*

Trust is essential to society and is the foundation of every business relationship. Trust is much more than just money; it is about human relationships and anticipating what other people will do. In risky environments, it helps to establish cooperation between mutually agreed parties which is otherwise costly to enforce. In financial services, trust acts as stock-in-trade. The Global Financial Crisis of 2008-09 exposed the failure of central bank institutions to properly regulate the financial system and portrayed the key weakness i.e. Centralization that has challenged the public trust in the value chain of financial services. The second era of digital revolution has the potential to change the way how we interact with each other and it has become possible through massive peer-to-peer communication using an internet of value. The technology behind such revolution is "Blockchain" or "Distributed Ledger Technology" (DLT). Blockchain is a distributed database in which data records (called as blocks) are stored and linked to previous blocks using cryptography and are

resistant to modification of the data. The distributed ledger gives the ability to financial services firms, to provide trusted third party services with a globally available, verifiable and untamperable source of data. Trust arises from the technology by combining encryption, decentralization and community control making a system nearly impossible for hackers to comprise. The process of comparison in the distributed network builds a "Trust Protocol" and undoubtedly provides with a simpler platform to conduct business transactions without having the need to pay a price for trust.

Stance detection and sentiment analysis of social media statements regarding vaccination

Helen Stancombe, *Manchester Metropolitan University*

The proliferation of user-generated data uploaded to social media in the age of Web 2.0 is allowing increasingly massive datasets to be gathered and re-purposed to inform many areas of research. One particularly fruitful area is that of public health surveillance and monitoring, where text data mined from the social web is providing new insights into health behaviours such as vaccination and vaccine hesitancy. Listed as the 4th greatest health threat of 2019 by WHO, vaccine hesitancy describes a reluctance to vaccinate yourself or your children. Reduced vaccination poses a huge threat to the reversal of vaccine preventable diseases worldwide, demonstrated by 2018's measles outbreak, the highest in a decade, in which 41,000 cases were recorded. Gauging and understanding public opinion on vaccination through computational text mining, classification of social media statements and subsequent algorithmic exploration of the data could help monitor and potentially alleviate the risk vaccine hesitancy presents. Stance detection and sentiment analysis are related areas of natural language processing that could help realise this goal. Stance detection is a technique that automatically distinguishes whether an author of a statement is for, against or neutral towards a given target, while the goal of sentiment analysis is to classify the opinion of an author as being positive, negative or neutral about a target. Applications for the understanding gained through these techniques include detecting distributions of stance and sentiment regarding vaccination and identifying areas at possible risk of disease outbreak, as well as those suitable for intervention.

Discord: How Technology has Changed Online Gaming Communities

Jennifer Bradshaw, *University of Hull*

Discord is a software platform created to support gaming guilds with a range of features that meet their needs for real time messaging, sharing media content, and voice communication. The features available within individual servers such as low latency, a comprehensive Application Programming Interface (API), and scalability has led to Discord also becoming the home of larger gaming communities, creating extra layers for gamers and the games they support. This poster will examine the technologies Discord is built on that have allowed it to occupy this unique space in the market, and why this has facilitated such a large uptake. It will then explore what a community is, how these larger communities have formed, and the impact this has on the games they support, on the gamers using the platform, and for Discord itself. This will be carried out via a case study analysing the Massively Multiplayer Online Role-Playing Game (MMORPG) World of Warcraft, and how larger communities have developed to support the player base, beyond the expected use of the platform to support individual in game guilds. Finally, the poster will study the evolution of the platform to date, becoming more than just a platform for gamers, and how it may evolve in the future as we move to communicate more and more online, building new communities and relationships with those around us, regardless of location.

A Virtual Reality Environment for Cognitive Rehabilitation in Patients with Brain Injuries

Kimberley Chong, *University of Bath*

The research project proposes a virtual environment interface for use in cognitive rehabilitation of executive functions in brain acquired injury patients. It expands on previous development of an immersive virtual environment by Zack Lyons from University of Bath. The research will propose an interface for use by therapists to manipulate the virtual environment to conduct cognitive rehabilitation compared to real-life environments where resources are limited. The cost and risks involved in real-life environments are also higher than using a virtual environment. Using a virtual environment, it will allow therapists to assess and train their clients by controlling the risk of harm or disturbance to others or themselves. The research project involves the development of an interface that allows clinicians to manipulate the simulated environment assessment by controlling different factors that will affect the patient's performance of executive functioning with an implementation of the Multiple Errands Test. This test is chosen as it is useful for therapists to conduct both assessment and rehabilitation. In addition, a semi-autonomous dialogue model that allows therapists to guide conversations would be used to provide a realistic social environment for patients to perform tasks involved and assist therapists to assess

"hot" executive functioning in the environment that is difficult to be assessed in real-life settings. A qualitative research with both patients and therapists separately and jointly will be conducted to evaluate the usability and validity of the virtual environment.

Classification of Hyperspectral Endocrine Tissue Images using Supervised Machine Learning Methods

Margarita Ivanova, *University of Glasgow*

Thyroid and parathyroid surgeries involve great risks, mainly because of the difficulty to visually distinguish between the two glands and also from the surrounding nerve tissue and lymph nodes, which may lead to follow-up operations or injuring unnecessarily an organ leading to complications both during and post operation. It is, therefore, beneficial to introduce a tool, which can assist the surgeon in the decision process of tissue differentiation during the procedure. One such solution would be hyperspectral imaging, a non-invasive and no contact technique, which provides reflectance spectral information of the region of interest in a wider wavelength range than the human can perceive. Initial testing of this method has shown differences between the two endocrine glands' spectra during open neck operations of several patients. Because of this development, several supervised machine learning algorithms are explored for the prediction of the parathyroid gland and analysed whether their implementation in a tool would be a beneficial addition in parathyroid surgeries. The results have shown that such implementation is reasonable, however further testing with bigger patient population is required.

The dark patterns - how good design can become bad

Maria Radu, *University of Bath*

Dark patterns design is a technique that is used online, in games or websites, and exploits the consumers that are overloaded with content and click on different things just because of a Pavlovian effect. This can happen because users are multitasking, content overloaded, signing up to something or just skimming through something a friend sent. The manipulative timing is also a big part of the dark pattern design as it takes into account when that choice should be presented to the user to make sure that their decision is influenced to the maximum by the pattern, and it is also impacted by interruptions that increase the user cognitive load and adding the deceptive design techniques can only lead to the user not having complete control on their actions during a key decision time. I find it fascinating how people can be tricked into doing certain actions by using patterns and design and how dark pattern design can be found everywhere and it is so common but yet many might not even be aware of its existence

Nature Nurtures, Computing, and electronics, a tool to teach empathy and care for nature.

Mariam Aomar Perez, *Sheffield Hallam University*

What comes to mind when we think about learning new technologies and programming? We probably think of inanimate objects, long lines of code and very complicated terminologies like algorithms, commands, object-oriented and boolean. How about if a younger learner like children is involved? I propose a new way of teaching and learning. My poster is about integrating life forms, in this case, plants in combination with machine learning and electronics. I feel that teaching computing and new technologies could be very removed from empathy, and other life skills necessary for the development of children. However, if we integrate learning activities that include living forms like plants, our young learners will acquire not only knowledge in new technologies, like in this case how to program a micro:bit but also how to care for plants. The teaching tool that I'm using help the student understand the basic needs and emotions of a plant, by giving feedback with a universal emotional response, the smiley face.

Self-driving cars : a dream, slowly taking a shape in reality

Shalini Chopade, *University of Greenwich*

Few decades ago autonomous vehicles were a hypothesis, but with the advancement of the computer technology and information systems, it is taking shape. Autonomous cars are evolving very swiftly with the help of amazing innovation in hardware, software and computing capabilities. However, it totally relies on artificial intelligence and deep learning capabilities to make informed decisions. Currently, Self-driving cars are the most attention-grabbing concept of Machine learning. The autonomous vehicle has to provide information about the surrounding to its machine learning algorithm, which can make prediction of possible changes to those surroundings. Still these systems are reactive, not proactive as human drivers are. While a human mind anticipates certain conditions along a route of travel, a driverless vehicle only reacts to input and corrects for that reaction. It challenges the powers of machine learning but also creates a social awareness in technology governance. While people are learning about smart technologies, this smart technology is trying to understand people. With the help of machine learning components, our technological society should create flexible regulation ensuring the safety, accessibility and new opportunities. Consumers are aware of the driverless cars currently being developed but user acceptance only can make it a big success. We need to study the user acceptance even before the technology is publicly available. They're nearly here, but, as a society, are we ready for them?

How is Machine Learning being Applied in predicting hard drive failures

Shiny Shelomith Henry, *University of Greenwich*

Hard Disk Drives (HDD) are the primary sources for storing important data files. Data storage is critical to any business. The consequences of HDD failure may result in additional cost to the company. It is therefore necessary to predict its failure. The characteristics of hard drives could be recorded from 1980s. Self-Monitoring, Analysis and Reporting Technology (SMART) predicts the failure using some of the attributes such as overheating, write faults, count of track seek repeats, sector reallocation and head fly heights. Machine Learning algorithms such as Support Vector Machine (SVM), Random Forest (RF), Gradient Boosted Tree (GBT) using SMART technique and Naive Bayes classifier have been suggested to predict the probability of drive failure. But manufacturing companies have failed to make the best use of the data. Few challenges exist in the above proposed models. SMART technique used for keeping track of HDDs are not uniform across manufacturers. The implementation of SMART techniques and attributes are unique to manufacturing companies. Hence it is essential to test the ML models with hard drives from different manufacturers. Also, the failure percentage for a model of hard drive seems to be below 1% per year making data collection about failure prediction difficult. The prediction accuracy for SVM, RF and GBT seems to be above 95% when tested with real world dataset while that of Naive Bayes classifier is outstanding compared to all other methods.

Ladies, if we distract them with our elegant table manners, they won't notice when we bypass the firewall

simone shaughnessy, *Salford University*

The words Women and IT don't often get used in a positive light - the IT industry is predominantly made up of men, still in 2019. In fact, in the UK at the end of 2018, just 20% of IT jobs were held by women. Maybe that explains why every technical role I have ever worked in, has resulted me in being the only female on the team. Lets focus on cyber security industry, my specialism, undertaking the MSC Cyber Forensics course at Salford University, again I was the only woman on this. Recently in the headlines, the RSA conference had just one woman on its speaker panel, out of 21 men. We need to shout louder, act faster, for the futures of our younger generation depend on us to do so. But it leaves much to the imagination, when tech companies hire a woman now, are they hiring for her skills, or for the diversity policy statistics to balance up? It is SO important for the world to realise that female cyber security professionals are not Trinity from the Matrix, are not the girl with the dragon tattoo, these are women with skills and attributes to impress. Girls from secondary age need know its ok to want to become a penetration tester and not get knocked in a misogynistic way because of their job title. "For most of history, anonymous was a woman", Virginia Woolf. It's ironic that the most controversial hacking group on the planet is called this.

Using Blockchain and IoT to Fight Counterfeit Products

Soumya Singh, *Durham University*

In a global economy, goods pass through multiple stages between production and the consumer, leaving them vulnerable to tampering and theft that amounts to an annual loss of billions of dollars to the global economy. The menace pervades multiple industries like pharmaceuticals, food, luxury goods, fast moving consumer goods etc. Apart from the colossal monetary losses and poor consumer experience, counterfeit medicines and adulterated food products kill tens of thousands of people each year, especially in low-income countries. The counterfeit goods industry continues to thrive due to the difficult nature of end-to-end supply chain tracking. The problem, however, can be tackled by integrating blockchain into supply-chain management. Blockchain, a digital ledger originally created for cryptocurrency transactions, now finds applications in various industries as it is tamper-evident and ensures easy verification and transparency. However, the application of blockchain to physical products and creating tamper-proof links, unlike digital cryptocurrencies, is challenging, which can be achieved through the application of Internet of Things (IoT). In this poster we will discuss in detail how blockchain can help ensure end-to-end transparency, its benefits and challenges and how this digital solution can be materialized for physical goods that are shipped all over the world. The technology, in its

nascent stages, is being researched by a pharmaceutical giant and promises increased consumer retention and stock monitoring in a recent pilot study, thus, we also shed light on the potential of its application in other consumer goods industries that can save a lot of lives and money.

How can 3D Printing revolutionise the classroom?

Tasneem Hafiz, *Sheffield Hallam University*

Over the years, a new digital age has emerged changing the way knowledge is being consumed and taught. The ICT curriculum has changed to 'Computing' where pupils are taught to code and build and create their own programs. In addition, there are new advancements in technology and software continually being developed and designed to aid a student with their learning. Thus, combining application and innovation with regards to the new specification. One emerging technology is 3D Printing which offers students a new and exciting way to learn their subjects. The poster will aim to discuss what 3D Printing is and how it works, from an initial design to a 'real-life' product. The poster will also include whether this emerging technology can be taught alongside the curriculum and what subjects will benefit the most from it. How can 3D Printing revolutionise the classroom? This poster will aim to find out.

On Fabulation and Imaginaries: Exploring the New Sublime in the Context of Ubiquitous Computing

Teodora Fartan, *Goldsmiths, University of London*

The ever-elusive relationship between technology and culture has undergone a process of transmutation within the wider backdrop of ubiquitous computing, giving rise to new strategies of artistic engagement that aim to provide critical insights into what it means to be human, or perhaps nonhuman, in an age where the digital has spilled into every aspect of life. Avoiding any medium-specific definitions, art practice is now being carried out through endless lines of code, in laboratory coats, by way of electronic sensors and endless streams of data: the transdisciplinary artist is at once technologist, researcher and explorer of new modes of existence. The socio-cultural uncertainty of both the present moment and the accelerated onset of an unreliable future cause disruptions in our linear perception of time, thus propelling the rise of new tendencies to speculate, fabulate and construct alternate imaginaries. This research aims to explore the vanishing points of old notions of the sublime and re-frames this concept in the context of the computational imaginary, offering a new way of thinking about immanence through the acts of fictioning and inventing alternative timescales and histories that ultimately emerge out of our engagement with technology. By taking a speculative stance, a new notion of the sublime as fundamentally fragmented is proposed as the direct outcome of the symbiosis between computation and culture, a

sublime no longer focused on mythical, utopian experience, but rather, in a similar manner to software, centred around alternate version releases and next version updates.

When screen time benefits social interaction

Vikki Richardson, *University of Stirling*

Autism can be as rewarding as it is difficult to live with. The mind of someone on the ASD spectrum is fascinating and can lead to brilliance such as the theory of relativity or evolution, amazing works of art such as the Sistine chapel ceiling or music such as Requiem. This ability to focus so determinedly on a specific interest can lead to the neglect of interest in social interactions and make relationship building difficult. For many on the spectrum reading social cues and body language is an ability out with their grasp. Whilst it is not clear exactly what causes this difficulty in social interaction there may be ways to help. Technology, and more specifically machine learning, can give the user additional input to decipher the body language we all emit daily that most people can interpret with no problem. Trials on an app used in conjunction with google glass have shown positive results with children on different levels of the spectrum. The power of machine learning algorithms can be harnessed for and transferred to a wearable product. This product supports the user by giving enhanced input bridging the gap that autism brings to social interactions. The standard of life for the user may be enhanced by allowing previously inaccessible relationships to form specifically if this were to be personalised for each user. No two people are the same, and bringing cultural expectations and understanding into the mix lends itself to a unique set of rules for each user. This is where machine learning can best be utilised and where research in this area can bring benefit.

Detecting and predicting depression from Twitter feeds using Machine Learning

Yara Mahmoud, *University of Greenwich*

As the rate of suicide and depression has increased dramatically in the past decade, the detection of depressive behaviour is needed. People are more likely to express negative thoughts on social media. Therefore, a supervised method will be used to classify and train a learner, specifically, classify users that suffer from depression from users that do not using their twitter feed and train the learner to predict depression using depressed users' past feed as input. As the learner needs to be fed feature vectors, valuable features need to be extracted from the data gathered. In case of social media posts the value of the data is in five characteristics; volume, reply posts, reposts, the proportion of links and fraction of question-centric posts, and insomnia index. The poster will present the results of current machine learning development that will identify suicidal inclination and predict probability of self-harm. The development will utilise natural language processing. The linguistic style of

the user should also be considered as there are keywords that can help with the classification process. The dataset will be constructed through streaming and analysing public twitter feeds over a period of time.