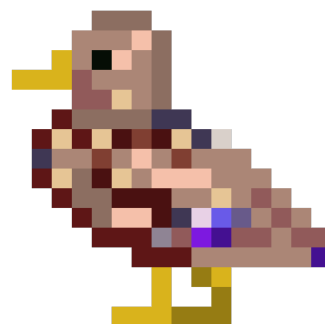




Abstract book
14th BCSWomen Lovelace Colloquium
Online, hosted by Lancaster University
30th March 2021

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Thanks

The Lancaster team: Lucy Hunt, Dr Miriam Sturdee, Professor Paul Rayson

The Speakers: Professor Dame Sue Black, Dr Kate Ho, Lorraine Underwood, Professor Carron Shankland,

The lightning talks: Ahsana Nabilah Choudhury, Christine Swan, Shuyu Lin, Tanya Howden, Tapuwa Mtutu, Wayne Hutt

All at BCS for their support, particularly Olivia Wolfheart and Mandy Bauer

The poster judges: Dr Amanda Clare, Dr Helen Miles, Tristi Tanaka, Nicola Martin, Andrea Palmer, Dr Safia Barikzai, Fiona Macaulay, Dr Louise Brown

Alex Stanhope, for designing our fabulous 8-Bit Ada

The sponsors:

RS Components Grass Roots

WCIT (Worshipful Company of Information Technologists Charity)

Amazon

JP Morgan

Oxford University AIMS CDT

STFC (Science and Technology Facilities Council)

Saggezza

All of the students who submitted posters, and all the employers with stands at the event.

Chair: Hannah Dee, Aberystwyth University

Deputy chair: Safia Barikzai, LSBU

Welcome

Chairs welcome:

Welcome to the 2021 BCSWomen Lovelace Colloquium. This is the 14th BCSWomen Lovelace Colloquium, and the second ever virtual Lovelace.

In an ideal world, we would be in Lancaster stuffing goodie bags ready for the arrival of students and speakers. we'd be excited for a lively day of face to face engagement, inspirational young women, computing and cake. we'd also be looking forward to catching up with old friends and meeting the next generation.

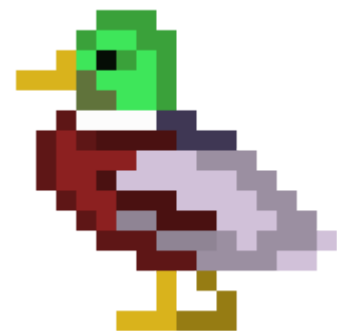
In this world, Hannah stuffed some envelopes (with stickers and chocolate) a week ago, Lucy's been putting together a virtual quiz, and we've been organising speakers and posters virtually for weeks. Around the country people are getting ready to spend another Tuesday on the Internet.

Like many of you we have been to *a lot* of online events and conferences over the last year. For us the best online experiences have been conversations and interactions, so our main conference platform (Discord) emphasises these. So please, watch the talks, enjoy the presentations, read the abstracts and posters, but most importantly chat with each other. We haven't got cake, or end-of-day chips, but we do have some great people.

Have fun, and be awesome to each other -

Hannah Dee, Aberystwyth (event chair)

Lucy Hunt, Lancaster (local chair)



Quack!

(the ducks are a Lancaster thing)

Programme

Note: The Youtube talks are live (as of Sunday 28th) and so can be watched in advance if you want. The student posters are also up on the Discord server. This allows attendees more flexibility in planning their day.

Speakers will be in their Discord channel ready to answer questions during the talk slot.

09.00-09.45 Log into Discord, look around, make yourself a coffee, say hello to people.
09.45-10.00 Welcome: Lucy Hunt and Hannah Dee
10.00-10.40 Keynote Professor Dame Sue Black **live talk, via Teams**
11.00-11.30 Break
11.30-12.00 Dr Kate Ho <https://youtu.be/dRGJCFacInS>
12.00-12.30 Lorraine underwood <https://youtu.be/G1qiSoebRUg>
12.30-14.30 Student poster presentations & lunch
14.30-15.00 Speaker slot 3: Skills and careers “buffet”: see below
15.00-15.30 Professor Carron Shankland <https://youtu.be/QAt2i-817R0>
15.30-16.00 Break
16.00-16.40 Panel : we will have a live voice chat in the Discord channel with 4 or 5 women in tech willing to try and answer any questions the audience have about careers, life, tech, work...
16.40-17.00 Prizes

The **skills and careers buffet** is a new idea for us: normally we have four talks as we are constrained by time and rooms. As we are online we decided to take advantage of the flexibility and offer a set of talks on the loose theme of skills and careers. These are all shorter talks (5-15 minutes) and attendees can pick and choose which ones they want to watch.

Tapuwa Mtutu of SEO London on “How to get a job with an elite employer”

https://youtu.be/wLy7Sm_V3KM

Ahsana Nabilah Choudhury of JP Morgan on “Digitising your Personal Brand”

<https://youtu.be/gCCY5iiPceo>

Wayne Hutt of RS Components on “Super Skills” <https://youtu.be/zULjHtfLEF4>

Shuyu Lin of Oxford University on “How to get a PhD place” <https://youtu.be/7TRREm8pxuU>

Tanya Howden of Volunteer Edinburgh on “The power of volunteering”

<https://youtu.be/ZW-FriMBIDE>

Christine Swan of Birmingham City University on “Getting into Teaching”

<https://youtu.be/VKPmCYRAbsE>

We also have a short Pilates video from Rachel Hubbard, to help people stretch and unwind during the breaks! <https://youtu.be/i37RfBAegek>

Speaker and talk information

Professor Dame Sue Black: Keynote

Professor Dame Sue Black is a leading anatomist and forensic anthropologist. She took up the newly-created post of Pro-Vice Chancellor for Engagement at Lancaster University in August 2018. She was awarded an OBE in 2001 and a DBE in 2016 for her services to education and forensic anthropology. She starred in the BBC series *History Cold Case*, and has written lots of books about forensic anthropology including a memoir "*All That Remains*" and a popular science book "*Written in Bone*". In 2021 she will enter the House of Lords as a cross-bench peer.

Dr Kate Ho: Data Engineering

Dr Kate Ho is a data engineer who is passionate about UX (User Experience). Or is she a user experience expert who's passionate about data? Sometimes it's hard to tell. Chief Technology Officer at Valla, a data startup in the legal space. Kate has worked in the startup sector (as well as this legal startup, she's also run her own educational games company). She's worked in big companies (Skyscanner) and the public sector (working on apps for mental health for the Scottish Government). Kate has a PHD from Edinburgh, does a lot of tech speaking, and is a long term friend of the Lovelace Colloquium having spoken in 2015 and sponsored the people's choice award several times.

Lorraine Underwood: I'm a maker

Lorraine Underwood is a first year PhD student at Lancaster University, interested in physical computing - that is, making cool things from computing and electronics. She has a channel on Element14 sharing her maker adventures, has written a book for kids called "Save The World With Code", and is an author, maker, teacher and general awesome person.

Also did we mention it's her birthday on the 30th? Happy Birthday Lorraine!

Professor Carron Shankland: Learning to make models

Carron Shankland is a Professor of Computing Science at Stirling University. Carron's research lies in the intersection of computer science, mathematics and biology: understanding the behaviour of biological systems through mathematical and computational models. Carron is committed to improving the situation for women in computing and STEM more broadly, and was a Suffrage Science award holder 2016-8, and has a Scottish Woman of the Year award for her work in STEM. Carron is also a long term friend of the Lovelace Colloquium, and was local chair last year.

Student poster abstracts

First year or foundation year

Will designer babies be the new fashion statement?

Alisha Qazi Durham University

CRISPR technology is a simple yet powerful tool for editing genomes. It allows researchers to easily alter DNA sequences and modify gene function. CRISPR's current uses include detecting specific targets such as DNA from cancer-causing viruses or more recently, to detect coronavirus. When being used to help prevent the spread of disease, people are more likely to support the use of CRISPR technology. But when do we start to cross the line between the ethical and unethical usage of CRISPR? It is more common than one may think for an image online to be edited. Due to this, society's beauty standards are becoming more challenging for people to live up to. Things that are normal to have such as acne are considered ugly in society nowadays. But what if we could edit out the "bad" and "ugly" genes from our children? People are more likely to support the usage of CRISPR to prevent the spread of disease and improve our quality of life, and we could say that altering the physical aspects of a child would have the same effect, however, for many, this is where we cross the line. With society's current beauty standards, is it truly unethical to choose how our children look? Would it not be better for our children to grow up without constantly worrying about how they look, or will our beauty standards continue to become more warped no matter what we do?

AI - AS A CRYSTAL GAZER

Diya Mukherjee Aberystwyth University

From smartphones to chatbots, AI is already ubiquitous in our digital lives. The massive amounts of data that computers can gather about our likes, our purchases, our movements every day has helped create the momentum behind AI and its future. Specialists in AI are using all that data to train machines to learn and predict what we want. Increasingly powerful computational capacity now offers the possibility of creating simulations of complex social phenomena. Of particular interest, the role that Multi-Agent Artificial Intelligence (MAAI) can

play is a system that allows the artificial simulation of situations where different actors interact simultaneously, forming a virtual society. MAAI is predictive modelling at its most advanced and will enable predictions to be made with extraordinary accuracy by testing them in detailed simulations under various conditions. If, for example, a campaign team wants to decide how and to whom to pitch their messages – to fight an election – it can do so, multiple times, inside a computer simulation. They can do so by launching their campaign in a digital utopia to a set of people whose views are formed by Multi-Agent Data Mining System, thereby replicating the actual world. This technology has the potential to tackle many other real-world problems; climate forecasting by collecting the data related to the flow of clouds and winds; predicting the pattern of aftershocks of earthquakes by keeping a tab on past mainshock and aftershock earthquakes by collecting seismic data; traffic flow management by collecting weather, IT, and driving behaviour data; online trading behaviours; disaster response protocols; social structure modelling, etc. AI-driven simulations are set to have a dramatic impact on the way we predict the future, almost like having a new kind of mirrored crystal ball with thousands of reflections of realities forming a single picture.

Your social media bubble: Who has control?

Elisabet Tammjarv University of Glasgow

It is no big secret that our internet feed is curated. From secretive algorithms to internet cookies that track and store all your online activity, chances are your computer knows exactly who you are and what content to feed you. This curated content is what we call a social media bubble. Although the bubble protects from the cognitive dissonance and the neural effort required when re-adjusting the brain to unfamiliar content, there are some unwanted side effects. My flatmate A thought it was a clear-cut win for Joe Biden in the recent US election. A is not alone in this, as the prevalence of our own world views are overestimated thanks to the bubble. Blocking out the “other side” decreases our empathy, as well as making us more susceptible to fake news and propaganda. Others can take gradual control of our social media through targeted posts and advertisements, cementing their world views, or political opinions, as Donald Trump proved through his targeted xenophobic Facebook ad campaign. This poster will feature ways to mitigate the effects of the social media bubble, focusing on why algorithms create bias as well as how to take back control by actively reach out and listening to the views of those who may have unpleasant and contradictory opinions.

Quantum computers

Farha Bibi Kingston University

Regular computer chips use 1s and 0s to manipulate information. While capable of supporting modern high-speed computing, quantum mechanics is challenging this binary approach. Quantum mechanics studies the properties of nature at a sub-atomic scale that supercomputers are incapable of registering. This has resulted in the development of quantum computers, giving rise to complex new algorithms that cannot be as easily solved by classical computers. Quantum computers involve three main principles: superposition, using multiple states at once; interference, a combination of superpositions to create waves; and entanglement which allows different parts of a quantum computer to be correlated even at far distances. Niels Bohr, Werner Heisenberg, Albert Einstein and Erwin Schrodinger revolutionised physics with the development of quantum mechanics. Understanding and mitigating against potential issues are just as important as nurturing the progress of these computers. Elegant solutions are being made to combat underlying concerns with security, contracting, inequalities, cryptography and more. Although in their early development, quantum computers are expected to achieve outstanding breakthroughs across many disciplines. Medicine would greatly benefit from the applications of quantum computers. By utilising machine learning, algorithms can aid the diagnosis of illnesses and diseases. This technology also has the potential to formulate strategies for financial analysis and produce intuitive solutions to allocate resources, such as ambulances, swiftly and efficiently. This amalgamation of physics, computer science and mathematics has generated an innovative key to many challenges, it is being perpetually advanced by the leading scientists of the past, present and hopefully future generations.

How to keep secrets throughout history

Inés Blanco Rivas University of Bath

Communication, cooperation, socialization, we can all agree that these aspects define our interactions as human beings. However, these aspects are true for other animals as well. But, there is another aspect of our interactions that is completely unique to our species: secrecy. It was long ago that humans discovered that communication was key to survival. As different civilizations grew and evolved clashes started to arise and they needed to keep their weaknesses and resources hidden from possible rivals. And so began cryptography. Certainly, ancient cryptography is now seen as simple, but it took a long time for non-computational methods to solve these codes. Throughout history, thanks to mathematics, and later to

computer science we have been able to keep our information in secret, and we still do nowadays. The importance of secrecy is no longer just important on a group level, but also as individuals. Every search on the net, every text message, every bank account, is protected by cryptography. Our current cryptography is very secure, as ancient cryptography was very secure in its own time. As deciphering techniques and hardware evolve, we start developing new cryptographic methods to make sure our secrets are not revealed. Through this poster you will learn about the past, present and future of the algorithms that maintain our secrecy as well as the reasons why they function.

Dopamine from coding

Jilliane Manansala University of Wolverhampton

During a time when mental health is placed at high value, it is important to consider the effects of the activities we do and what we thrive our attention towards. Dopamine is a chemical found in the body that is responsible for motivation but also plays a role in how we feel pleasure. In modern times the way in which we acquire dopamine is very simple, most notably in the form of instant gratification such as watching tv, ordering takeaway, going on social media etc. Although instant gratification gives us that quick feel of joy, it is very short-lived and often finds that the consumption of such activities turns into an addiction. To prevent such momentary burst of pleasure, delayed gratification is what we should seek, in the form of creation rather than consumption. Creation is doing, it is activities that humans partake in, such as drawing, dancing, coding. It brings out that same chemical that released pleasure, but rather than addiction, it often leads to a person's passion or one of many because of its continuous release during the process. As mentioned, coding comes under creation, that delayed gratification. It provides that feeling of pleasure through the process, the excitement, the feeling of triumph when a code finally works after long hours of tweaking and the test of the programmer's mindset. In computing there will always be bug encounters and difficulties however, part of the joy within it is solving the problems that arise, pursuing further achievements and unconsciously challenging yourself to develop your knowledge.

Digital Ladies and Their Creator Goddesses: Representation of Women in the Video Game Industry

Karolina Kowalska Durham University

When you think of video games, the genders of characters might not be the first thing that comes to mind. Sexualisation of women within gaming is still running rampant, and it doesn't seem like we'll ever be able to stop it. However, the medium is full of strong, wilful and resilient heroines that continue to rise against adversity. Edelgard from Fire Emblem: Three Houses wages a war on an entire continent, Rosalina from Super Mario Galaxy becomes the mother to billions of lonely stars in the cosmos despite suffering from a terrible loss, and Madeline from Celeste overcomes her fears and learns that your biggest enemy can happen to be yourself. While these are all inspiring figures that we should all celebrate, the women behind the medium aren't talked about half as much as the ladies on-screen. Games are accredited to large corporations dominated by men and those talented, hidden figures are rarely mentioned, if at all. The aim of my poster is to explore some of the female faces of the video game industry and their respective accomplishments and works, as well as to explore a few prominent video game heroines. I also aim to include some original research in my poster which will involve asking my female peers questions about how they perceive the video game industry.

Are you human? : An Exploration into Cybernetic Augmentations

Kirandeep Rai University of Wolverhampton

In 1960, the term "cyborg" (cybernetic organism) was first used by Manfred Clynes and Nathen S. Kline where they described it as a being comprised of both artificial and human parts. Overtime this notion has been fictionalised by media. But with the exponential growth of technology between the 20th and 21st century, the synergy between human anatomy and technology has transcended the realm of science fiction and is now a common occurrence within our daily lives. The most common cybernetic augmentation first took place in 1958 when Åke Senning implanted a pacemaker into a patient. Since then, over a million pacemakers are implanted globally each year. This now means those patients' lifespans will be increased by 5-15 years. Likewise, cochlear implants used to treat severe hearing loss are implanted into the auditory nerve. The primary purpose of cybernetic augmentations so far has been to treat ailments and increase shortened lifespans. This poster will explore the applications and technologies behind current and future cybernetics. It will delve into the impact this may have on society and the human race as a whole. With ventures such as Neuralink humans' cognitive abilities may one day be enhanced too. This alongside the gene-editing technology CRISPR-Cas9, may mean the humans of today will be different from those of tomorrow. In such a case it will question whether this is the next step in human

evolution, where we get to decide how we change, or will it redefine what it means to be human.

Using Artificial Intelligence for Cervical Cancer Screening

Laura O'Sullivan University of Edinburgh

Cervical cancer is the fourth most common cancer in women. Annually, over 300,000 women die globally from cervical cancer. Cervical cancer is however one of the most treatable cancers when it is caught early. Screening for cervical cancer has helped reduce the rate of cervical cancer, however many barriers still stand as cervical cancer screening is prone to human error. The motivation behind this poster is the recent cervical cancer screening scandal in my native country Ireland where hundreds of women had false negatives in their cervical smear test results. Many of these women have developed terminal cancer. This could have been avoided had they received the correct diagnosis. This scandal shook the country to its core as we saw how the health system failed Irish women. Using Artificial Intelligence (AI) for cervical cancer screening would eliminate the risk of human error and could save countless lives. AI based cervical cancer screening could also reduce costs and improve accessibility, helping women in areas where access to cervical cancer screening is limited and expensive. Currently, poorer regions of the world have higher rates of cervical cancer and more women pass away because of abnormalities going undetected. This poster will look at the potential use of AI for cervical cancer screening, its benefits and drawbacks, the challenges facing an AI based screening system, and in particular its impact on reducing the number of false negatives and helping women in poorer areas in order to save lives across the globe.

Am I Being Censored Just For Being Disabled?

Madeleine McMurray The Open University

The Covid-19 pandemic highlighted the importance of social media and video services when keeping in touch with loved ones, however navigating these spaces as a disabled person is not easy. Many social media platforms have limited “built-in” accessibility options, if any, and often rely on external applications. But what if the problem goes deeper than a lack of accessibility? In December 2019, the Chinese company ByteDance confirmed that their social media platform, TikTok, suppresses the views of videos of disabled creators, under the guise of bullying prevention. Video captions are also a target for excessive censorship, as there are auto-captioning services that automatically censor words that are considered inappropriate,

without options for editing. Social media algorithms have also suppressed videos that cover subjects such as LGBTQ+ issues and sex education, due to the “trigger words” in the captions. We will discuss the existing hurdles to accessibility in social media, and what impact that is making to the visibility of disabled creators and influencers. This poster will also discuss why it is important to design services with disabled people in mind, and how a lack of diversity within social media companies can compound the problem. And finally, this poster will propose some solutions and changes to be considered in the future.

Can robots replace soldiers in war to avoid bloodshed?

Mithara De Alwis Durham University

In this generation, it is common for Alexa to be our personal assistant, to unlock phones with a glance at the screen and using apps to monitor traffic whilst travelling. Artificial intelligence is prominent in society hence why numerous mundane activities have been overtaken and often outperformed by AI techniques. In 2013, General Robert Cone, head of the US Army Training, stated that ‘machines like drones and robots could replace up to a quarter of troops in combat by 2030’ since they are a ‘smaller, more lethal, deployable and agile force’. Potentially, soldiers could be replaced by their fellow robotic comrades who will be simultaneously faster and more precise than humans. Using robots will reduce human casualties and may help prevent anxiety, post-traumatic stress and other mental and emotional issues that emerge from war. The robotic industry is growing exponentially, seeping into various sectors in the human world. Although, when will the robotic revolution reach a plateau; where is the limit? Is it a black and white issue or does the solution lie inside the grey middle ground? The proposition of using machines to terminate human life will spark a global moral and legal debate. The poster will discuss the implications of merging AI and humans on the battlefield. Before diving into this prospect, it is essential for one to consider their personal moral view on this very matter. If robots are to be deployed in war it will be a huge turning point in history, either revolutionary or disastrous.

Ethical issues of biased datasets in facial recognition.

Natalie Sharp Kingston University

Facial recognition is software used to verify a person’s identity using algorithms, whether it being for biometric security or law enforcement. There are numerous benefits to this powerful tool: it can be used as a security measure to easily unlock your mobile device, provide fraud

protection on ATMs or recognise criminals. This too can be used in large crowds to easily identify and track problematic people. The Neural networks at the heart of facial recognition are designed to process and detect biometric patterns which are then analysed against data sets to authenticate the individual's identity. Discrepancies in the technical analysis for facial recognition could produce false outputs leading to a biased system, which could discriminate against faces that are dissimilar to those in the database. As a result of the database being non-inclusive (i.e., fewer data of people of colour), the limited data sets will unequivocally result in a bias, thus risking an incomplete trained algorithm. This is especially problematic when facial recognition is implemented in policing as it may misidentify an innocent person. In 2020, Amazon, IBM, and Microsoft refused their services of facial recognition systems to law enforcement services due to racial profiling concerns. Currently, most facial recognition software has a high error rate with people of colour, creating significant inequality, thus proving facial recognition is not fit for purpose in instances such as law enforcement. Implementing laws which safeguard racial minorities is necessary to ensure a just and egalitarian system. Furthermore, inclusive data sets would help to countermeasure systematic racism within facial recognition technology.

“Hey Siri, I don’t feel too good!”

Purvi Harwani University of Edinburgh

Despite technology serving as a mechanism for enhancing our conversations, it still lacks a crucial factor for effective communication: empathy. In an ideal scenario, one wouldn’t expect the answer “I’m not sure I understand” in response to expressing vulnerability, even if it’s coming from a digital voice assistant. Our post-Covid world demands ubiquitous use of Emotion-Artificial Intelligence (emotion AI) now more than ever. Imagine adaptive learning technology (integrated with emotion-AI) simulating an experience delivered by a human educator or a virtual agent helping you navigate the difference in tone between “okay” and “ok!” on chat by gauging the conversation’s affective prosody? If ethically delivered, the possible applications are endless! Since the start of the pandemic, there has been a significant increase in the number of distress calls owing to one of the most common reasons – “stress and anxiety from being deprived of human interaction”. This is exactly the gap emotion-AI attempts to fill. Currently, an effective deployment may be in the health sector where physicians can respond to real-time insights on the patients’ stress-levels and adjust the care offered accordingly. This is achieved by the AI systems capturing the subtle changes in our cadence and expressions which are often overlooked by humans. It is worth debunking the myth that these systems will entirely replace the professionals’ jobs. For a successful rollout,

this technology works best with reinforcement learning i.e., keeping humans in the loop. This poster will focus on how we'll be in a much better position to handle another pandemic (or a crisis) by embracing emotion-AI.

Protein-Folding: How Technology is Advancing Research on Biology's Biggest Mystery?

Rita Paulino da Silva Kingston University

Proteins are defined as the building blocks of life. These molecules are present in every cell of the body and are involved in a range of metabolic reactions. Proteins are made up of strings of amino acids that fold into a three-dimensional shape, consequently holding the secret to determine their function. For decades scientists have been trying to understand how a protein folds into a complex structure as such knowledge is to develop new drugs to treat human disease, including cancer, dementia and infections. For example, as part of the fight against Covid-19, scientists have studied the virus's spike protein structure to understand how it interacts with human cells. Recently, Google's DeepMind has created an Artificial Intelligence program called "AlphaFold", which they claim is able to predict how a protein folds. How accurate are their predictions compared to the actual structure? AlphaFold runs a program capable of taking advantage of information collected on the three-dimensional shape of the hundreds of thousands of proteins stored in a worldwide database. Their program only takes a few days for generating a prediction, compared to the several years it usually takes when performed in a biotech laboratory. After reviewing AlphaFold's predictions' accuracy, they are compared with its competitors' predictions results. Finally, the current status of the field of protein folding prediction is discussed.

Machine Learning in Hearing Aids

Roshni Vachhani Durham University

More than 10 million people in the UK alone are Deaf or hard of hearing. Several of these people use hearing aids, small electronic devices that either goes in your ear or outside your ear helping those with hearing loss listen, communicate and participate more in the world around them. Whilst hearing aids do significantly improve their lifestyle, one key problem it has is differentiating different voices and sounds in noisy environments. Through the use of Convolution Neural Network (CNN) experts are trying to project mixed audio signals without

prior exposure and separate each signal from the input. Then Recurrent Neural Network (RNN) is used for the learning and estimation part of the process, which is typically very successful because of its short term memory. However, the focus of the elimination needs to be on background noise not speech to help hearing aid users.

Cancel Culture & Celebrity Cyber Crisis?!

Sanchia Mowatt University of Wolverhampton

Gradually, social media platforms have taken centre stage when promoting and up keeping with a celebrity or influencer's personal brand and product. It is a popular and productive way for individuals to engage and be relatable to their followers by posting free or sponsored content, centred on themselves or the things they do. At a subtle glance, the thousands and millions of likes and flashy outfits can all seem like living the best life, however it all paints a darker picture, especially with the rise of cancel culture and of course, increased cyber-attacks. Celebrities and socialites often face opposition from over-zealous fans who harass or overextend their affection for or cancel influencers based on something they have done or did. Nevertheless, they face an even bigger obstacle; some are targeted directly by hackers looking to exploit their secrets or identity. Others, find information from old posts to video clips discovered and use it against them, potentially alienating their fans and getting them "cancelled". Instances include phishing celebrity accounts and posting racist and homophobic language or locking them out of their own platform. This poster explores the issues of cyber security threats from a celebrity point of view, examining some of the techniques used and notable cases of where privacy and reputations have been compromised. It will also examine some of the defenses against these damaging, and often illegal activities, considering the issues and challenges for managing online reputations and cyber security in the future.

Extreme Exploitation in the Deep, Dark Web

Saxon Partridge-Smith University of Wolverhampton

The dark web has become a rich source of information with many thriving on the anonymity it offers. The benefits of this can be freedom of speech and the opportunity to openly express yourself without social constraints. However, sometimes the side effects of this free exchange can lead to quite horrifying consequences. Recent studies have found that over 80% of traffic on the dark web goes towards sites harbouring material featuring abuse and exploitation. One study in particular classifies these as "sites where the title indicates some form of sexual

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abuse, typically regarding minors”. Unfiltered environments such as the dark web attract criminals wishing to share their extreme interests and experiences with likeminded people. Evidence suggests that coteries develop on anonymous forums and are used as a method of sharing exploitative material without fear of being identified. Unfortunately, the extreme content of the dark web does not leave much room for imagination. This poster will explore the issues around the effects of extreme and illegal material. This will include the categories of material, the behaviours associated with those attracted to it and the overall effect on society of its increasing normalisation.

Second year (or third year for 4-year BSc courses)

Is the Welfare State Disappearing Behind a Web Page and Algorithm?

Ammara Yasin, Divya Bhagat, Royantha Romans Lancaster University

The UN's Special Rapporteur on extreme poverty and human rights, Professor Philip Alston observed that 'the British welfare state is gradually disappearing behind a web page and an algorithm, with significant implications for those living in poverty.' In the same report, he noted the UK had effectively built a 'digital barrier' that obstructs access to welfare, particularly disadvantaging older people, people who do not speak English and persons with disabilities. In 2013, the Department of Work and Pensions (DWP) published their Digital Strategy. This saw the British government undergoing a massive digitalisation effort with regards to welfare, specifically Universal Credit(UC). But in an effort to streamline the benefits system and cut administration costs it was found that those most likely to rely on now-digitalised services were simultaneously those who were least likely to possess both the physical technologies and the digital literacy to be able to access them. In the DWP's own 2018 survey, only 54 per cent of all UC claimants were able to apply online independently, without assistance. This poster will present an overview of the digitalisation of the UK welfare state, and in particular look at the sociopolitical context of accelerated digitalisation caused by COVID-19.

"Platinum Dust: Female Tech Role Models in the Classroom"

Amy Ellis University of Wolverhampton

The lack of female professionals in the tech industry is well known, as is the lack of young girls choosing to study computer science in key stage 4. Could this be a direct effect of the lack of female computer science teachers in secondary schools? As a lone female student on Computer science with Qualified Teacher Status the evidence suggests that the number of women training to teach computer science is currently very small. The fact is, women who specialize in computer science can earn a lot more money outside the teaching industry with a lot less stress, so does there need to be funds put into the education sector to cover this deficit and bring more female science teachers into the secondary schools? This poster will discuss the important role for female science teachers in our schools, to encourage interest among girls by pushing them to take risks, go against stereotypes and raising their confidence in their abilities.

Gender bias in our virtual assistants: where do the problems lie and what can we do to combat it?

Amy Laws Durham University

With virtual assistants becoming increasingly integrated into our lives, they are under close scrutiny. Gender bias has been identified in a range of different features in virtual assistants, from the fact that they are commonly characterised as female to the issues some voice recognition services have in accurately and consistently recognising female voices. This naturally raises the question, 'what is causing this bias?'. Many AI algorithms are biased. One reason for this is that women are underrepresented throughout the technology sector. This can lead to biased algorithms and AI systems because the population that design them does not accurately reflect the population that end up using them. Bias could also be caused by assumptions made during the algorithm development process or even bias in the training data. These often reflect historical or social inequalities. For example, the reason why male voices are recognised more accurately by virtual assistants could be that there is a lot more existing training data on these kinds of voices. Therefore, the algorithms won't perform as well with data it sees infrequently. There are huge efforts being made in the industry to combat this bias. We are developing more advanced techniques to identify where this bias exists and are working to improve the algorithms we already have. We are also actively working to address the gaps and prejudices in our data. This poster will explore the next steps in combatting this gender bias.

Have we corrupted AI with our biases?

Francesca Mirandola University of Stirling

Nowadays, Artificial Intelligence (AI) is gradually pervading our lives giving us the opportunity to benefit from extraordinary technology. We trust AI systems not only in our everyday life as personal assistants but also in more sensitive areas such as hiring, healthcare and criminal justice, thinking that algorithms are more efficient and reliable options than humans. Nevertheless, experience with real-life AI application brought up new faults in algorithms: in some circumstances the systems were failing because of the biases they inherited from humans in their training data or in the way they were programmed at first. An example is the case of Amazon recruiting tool which was penalising women and minorities because it was mainly based on historical recruiting data (white male dominant). Another example has been

facial recognition, which has higher error rates for darker-skinned people due to the lack of representation in the training data. Many different human biases undermine the fairness and adoption of AI, not only the ones regarding our sex or ethnicity. This poster attempts to give brief explanation of why algorithms can have biases, an insight of the main ones and the way the AI community plans to avoid them. Humans cannot be unbiased, but AI systems potentially can.

Encouragement for Woman in STEM

Jaimiee-Leigh Bird University of South Wales

The common knowledge in high schools surrounding STEM subjects, particularly Engineering is that you MUST be smart to succeed and how it sounds like a 'hands on' and 'dirty' job or it's too 'technical'. This is far from the truth as many engineers succeed with experience only. You don't need to enjoy everything about maths or science (although it helps) to succeed in Engineering as these subjects are not the final product. You only need to understand the principles. There are so many different types of Engineering which need to be discussed and taught to the younger generation. Knowledge of such jobs within teenagers is scarce. The poster shows real data of woman in STEM and how scary the percentages are. Whatever a person's interests, there will be an area of STEM to suit. A day as an engineer is not a boring one, as every day is a learning day! I think encouragement towards STEM is very important and should be taken seriously if we want the industry to change for the better. Knowledge, interest and strength are the 3 things I've chosen to discuss as I feel these are 3 major factors to encourage woman into engineering.

Virtual Reality in Healthcare: Fantasy or Reality?

Maida Alamgir Manchester Metropolitan University

Virtual reality (VR) is a computer-generated three-dimensional environment designed to allow users to experience a given synthetic environment as close as the real world. It enables users to temporarily disconnect from the real world by making them believe that they are immersed in the synthetic realistic virtual environment. Even if it might sound astoundingly modern, the development of VR began back in the mid-1950s. Following the advancement of technology over the years, VR devices have eventually evolved to become more powerful and yet compact and affordable. This enables VR devices to have a wide range of use cases including to acquire players' abilities in video games, to learn how to perform heart surgery, and to improve to

maximise training results. Here we focus on the development of VR technology in the healthcare sector, which enables healthcare to operate in a safer, more efficient, and cost-effective manner. Traditionally, teaching and training for healthcare professions are conducted in a real-life scenario which is typically high risk, and any errors may be costly. That is why VR is increasingly used in complex surgical training to promote and accelerate surgeons' learning progress by providing practical scenarios that are repeatable without real-life consequences to address complex procedures. Through bespoke training platforms, learners can immerse themselves in different levels of surgical scenarios in order to develop their skills and to inform clinical decision-making, as a result, dramatically enhance overall performance. Even if it might sound astoundingly modern, the development of the VR began back to the mid-1950s. Following the advancement of technology over the years, VR devices have eventually evolved to become more powerful and yet compact and affordable. This enables VR devices to have a wide range of use cases including to acquire players' abilities in video games, to learn how to perform heart surgery, and to improve to maximise training results. Here we focus on the development of VR technology in the healthcare sector, which enables healthcare to operate in a safer, more efficient, and cost-effective manner. Traditionally, teaching and training for healthcare professions are conducted in a real-life scenario which is typically high risk, and any errors may be costly. That is why VR is increasingly used in complex surgical training to promote and accelerate surgeons' learning progress by providing practical scenarios that are repeatable without real-life consequences to address complex procedures. Through bespoke training platforms, learners can immerse themselves in different levels of surgical scenarios in order to develop their skills and to inform clinical decision-making, as a result dramatically enhance overall performance.

Can a robot look after of our health?

Maria Alamgir Manchester Metropolitan University

AI has been introduced in the 1950's and has since experience continuously growth particularly in the last two decades. AI enables computerised system to self-learn and mimic human behaviour to perform a wide variety of human tasks. AI is used across several sectors ranging from more critical systems such as national security and military operations to day-to-day applications like social media and medical diagnostic. The use of AI in the healthcare sector has been rapidly increasing. AI has revolutionised the way healthcare is delivered to humans in a way that has never been possible in human history. These include automated disease detection, new drug or vaccine discovery and online patient support. Firstly, AI is able to utilise a quicker data-driven approach to facilitate disease detection by

analysing scores of patient medical scan and history. This also helps reduce repetitive and laborious tasks allowing medical personal to focus on critical tasks. Secondly, AI is used to expediate resource-intensive process like in drug or vaccine discovery. This is paramount especially during a pandemic as the sooner a vaccine can be discovered the more infection can be prevented and consequently the more life can be saved. Thirdly, AI-based chatbots can provide 24/7 human-like respond to provide online patient support. These chatbots comes with two benefits, one is the reduction of call times which helps reduced medical personals' workload. Secondly, sometimes medical personals have unconscious biases in decision making, but with unbiased training data, AI can more objectively diagnose patients without predetermined socio-economic notions.

The art of programming

Marta Adamska Lancaster University

The primary purpose of programming is to achieve a specific computing result or make a computer perform a task. But is it all of it? Or can it also have another, more profound meaning to it? When we think about it for a while the conclusion is that coding is much more than what it seems to be – it lets us create, learn and explore new worlds that would not be accessible for humans. We would never know about things like the Mandelbrot set, an infinite pattern that never repeats itself. Could we play a masterpiece of a game that the Witcher is? The whole world of animation that is possible to happen just because we learnt how to code. Using machine learning, we can even teach a computer to create its own work of art. The obvious thing is that not every single programme ever created is a work of art. As well as in other disciplines, we have to give more attention and detail to our creation. Like dancing, it requires hard work. Like with painting, we need to use the mind's eye. Like literature, grammar is essential. We also have to be imaginative and ready to explore the unknown. Our world is changing, and so is the art we create. Coding gives us many new opportunities to change the art community in ways we have never imagined.

#FakeNews. Deciphering fact from fiction.

Melissa McKenna Manchester Metropolitan University

Since 2008, the use of technology, specifically social media, has become instrumental for candidates running for president in America. The campaign to be president is fought on a national scale, in full glare of the wider electorate – in televised debates, national press

coverage, social media output and professionally managed public rallies. Technology, if used correctly, can influence voters as it allows candidates to convey their political agendas and act as a sounding board for how successfully these agendas are being received and accepted (thereby allowing candidates to adapt their strategies as the campaign progresses). However, the use of technology and social media can also be detrimental. Technology allows opinions of politicians to be released impulsively and yet accessed by the public freely. Reports show that there are politicians who have misused technology to spread unverified information or conspiracy theory. With this in mind, what are the most effective ways to prevent false information being spread? There are numerous ways for the general public to check facts before spreading the information, including; official social media accounts, press releases, checking for verification, understanding their credibility, and many more. However, it is also the different technological platforms responsibility to ensure information released from their platform is official and been thoroughly checked to be true. The poster will present various techniques on how information can be filtered, ensuring an honest, unbiased political campaign can be presented to the general public.

New High Street

Molly Barrett Cardiff Metropolitan University

Being almost a year into the coronavirus pandemic it is evident that everything we knew is different. How many times have you been in the situation that you need shopping? Essential and non-essential whether it be from groceries to clothing but you can never buy everything you want from one place. Constantly putting orders into different websites and receiving multiple emails with your invoices because you need groceries and a new pair of jeans from your favourite place etc. what if..... one app, one invoice. The pandemic and restriction rules have had a massive effect on the high street meaning that it is dying rapidly, but this does not need to be the case, the birth of the virtual high street will save many stores that are struggling right now. This has been done on the High street with big names like Debenhams that sell many different brands in one place but never a massive online version that is now needed. Making everything accessible. It is well known that amazon is a massive contributor to the loss of the high street as it has the accessibility that everyone needs right now, but this concept would support the high street meaning that it is the antidote to the amazon surge, giving every business a fair chance.

Could a robot commit the perfect murder?

Molly Ives University of Bath

For as long as crimes have been formally investigated, there has been the concept of a ‘perfect crime’: a crime unable to be attributed to an identifiable perpetrator, leading to the case remaining unsolved. These crimes are much more common in fiction than in reality, due to the large number of factors that could lead to identification. As Locard’s principle states: ‘every contact leaves a trace’; but does every robot contact leave a trace? At surface level, many of the elements that make crimes traceable are very human, such as fingerprinting, DNA analysis and blood. But the technological advancements that allow us to create robots have also drastically improved forensic analysis, such as utilising Artificial Intelligence to assist with automated fingerprint identification. Would digital forensics allow us to trace the origin of the robot? Perfect crimes involve leaving as little trace as possible through careful planning and precise execution. However, they also involve a certain element of luck. For example, in 2009 a \$6.8 million jewel theft was left unsolved as police could not prove which of two identical twins the DNA found belonged to. Perhaps precisely constructed algorithms and the higher degree of planning involved with a robot could eliminate or significantly reduce this element of chance by ensuring that nothing traceable is left at the crime scene. This poster will discuss current forensic techniques combined with an analysis of algorithms and Artificial Intelligence in robots to answer the question: could a robot really commit the perfect murder?

Is AI the Next Big Thing in the Retail Industry?

Rabia Khawar Manchester Metropolitan University

Artificial Intelligence (AI) is a sophisticated technology that enables machines to be equipped with human-like characteristics such as, visual perceptions, speech recognition and decision making. AI has benefitted many industries, especially the retail industry as it makes it possible to predict consumers purchasing behaviour, thus providing retailers with valuable information to tailor their communication techniques and sales strategies. Amazon, with AI implementation, took shopping to the next level whilst launching its very first store, Amazon Go. Amazon Go is a “Just Walk Out” shopping experience, which uses the same technologies used in self-driving cars such as, computer vision, sensor fusion, and deep learning. These technologies automatically detect when products are taken from or return to the shelves and keeps track of them in a virtual cart. Once customers are done shopping, they can leave the store without the need to make the payment because their Amazon Go account will be charged accordingly. Amazon Go is the first prototype of “smart-retail”: the absence of the

classic checkouts is undoubtedly aimed at improving customer experience. The goal is to speed up the customers' purchase process, especially for those who have little time to shop. The usage of sensors and cameras have the purpose of accessing a real database relating to the interests and behaviour of users, essential elements for developing increasingly targeted and personalized marketing strategies. Although, many customers have concerns regarding their data being used wrongly or even get leaked.

Erwin Schrodinger was not a cat person.

Sarah Cleland University of Stirling

Erwin Schrodinger was very clearly not a cat person and I'm personally not sure how well we would get on as a result. However, his thought experiment has raised interesting scientific dilemmas and advances. In his experiment, a cat is put in a sealed box with a jar of poison and radioactive material. The cat will be killed if a single atom of the radioactive material hits the jar. This means that the cat is living and dead at the same time, in a superposition until someone looks in the box. The cat's state is determined by opening the box, called a quantum jump. In quantum computing, cats have been thankfully replaced with qubits, states of undefined bits that store information. Traditionally in computing, a bit can either be 1 or 0, it cannot be both and it cannot be neither, it has to be either or. With quantum computing, it can potentially be 1 and 0 at the same time until they are looked at. Using and developing quantum computing is beneficial as it is more powerful than traditional computing and can do more processing with less power requirements.

Gender Bias Reflected in AI Assistants

Sargam Telang University of Edinburgh

Artificial intelligence and robotics are intended to free us from human limitations, but it seems that gender stereotypes are not one of them. It is not hard to notice that popular voice assistants Siri, Alexa and Cortana have their default voice as female, are given female names and are marketed as a female assistant. In the patriarchal concept of society it is deemed that it is a woman's role to be obedient, serve and assist their male counterparts whether virtual or physical, fictional or real. The robots that men voice, tend to be in positions of power, as observed in films like The Terminator. Male AI is used in narratives of film and media where technology becomes cruel and powerful. AI thus reflects the biases of its creators and it is what humans design it to be, learn, and do. It unconsciously reinforces and amplifies the

stereotypes based on those biases. Hence designing these assistants consistently with a female voice can reflect traditional gender roles. Switching these popular AI to a man's voice is not enough to tackle these stereotypes. For an AI assistant to have a sense of gender identity it needs to be more inclusive at where it is created. The lack of gender diversity is the cause of the industry's ability to catch gender bias while machine learning and database design. Thus having more representation of female, non binary and underrepresented groups of people at the workplace, would be the ideal first step.

How Computer Graphics Can Save Lives

Stefani Dimitrova Swansea University

Graphics and visualization have played a major role in healthcare dating back to Nightingale's time and the Cholera outbreak. Nightingale's diagram of mortality causes in the army led to a great discovery on why soldiers were dying. John Snow later used data visualization in the form of a location map to deduce the Cholera infections stemmed from contaminated water, as opposed to bad air. These methods of data visualization and graphic design are being used to this day to make easy and informative graphs about Covid-19. For instance, does the slogan 'flatten the curve' sound familiar? Although, it does not stop there. Through ground-breaking algorithms such as ray tracing, volume representation and automated image segmentation routines, we can craft 3D anatomically correct representations of the human body. We can distinguish between different components of the human body, such as fat, muscle, and bone, and view areas of the body previously unseen through things like CT scans. CT scans help diagnose and monitor conditions and help guide the patient and healthcare providers to the appropriate, least invasive treatment methods. The life-like anatomical models created can then be used for procedures like surgery stimulation for medical students, reducing the number of medical errors made, the cost of training, and lethal infection rates.

The effects of quantum technology on the security of the everyday user

Tara Harley University of York

The rise of quantum technology will influence all aspects of computer science from search algorithms to machine learning but its most drastic and pertinent effect for the everyman will be how it affects cryptography. Cryptography is in quantum computing's roots- one of the first

quantum algorithms conceived was Shor's Algorithm, which can factor large numbers almost exponentially faster than the best classical factorisation methods and thus is far more effective in breaking RSA and other factorisation-based encryption methods, which is a problem as that is the most common method of encrypting keys to keep information secure over the internet. Whilst the average household may not be getting quantum computers anytime soon, the fact that they will be wieldable by governments and large corporations alike makes this an immense security risk, hence another effect of quantum computing doesn't even involve quantum computers but the attempts to find encryption algorithms which can't be broken using quantum algorithms, the up-and-coming area of research which is post-quantum cryptography. Quantum technology doesn't just have negative effects on security though! Quantum key distribution is such a secure method of distributing cryptographic keys between two parties that it can't be spied on without that spied on key failing, according to the laws of physics. Whilst it may not be door-to-door for most households, it will likely be used across fibre-optic networks for large companies for maximum security of communication which means that, for example, banking data will be far more secure.

Has the Coronavirus Pandemic Changed Perceptions of Technology's Impact on Children's Mental Development?

Victoria Simpson Sheffield Hallam University

How have opinions changed in the last 12 months on technology's advancements within the world? Are the changes in technology, and its uses, as damaging to children, their education, and Generation Z's work ethic, as bad as some originally thought? Technology has many positive implementations within education, especially in the new Covid world. Whether it be showing PowerPoint slides on Zoom, doing online quizzes, utilising applications like Kahoot, or allowing teachers to make all resources accessible to anyone with an internet connection. Since the pandemic began in 2020, the advancements in technology have allowed school children to carry on with their classes without much interruption to their education which, would not have been possible otherwise. However still, the question remains to be answered; Are the negative opinions on screen time and children's uses of technology still believed? Children now have more screen time than any generations before them. Is this impacting on their physical and mental development, as well as their social skills? Will children be reliant on technology as their social life progresses and is it possible that this could create a generation of recluses? With Google as every student's best-friend, are the long-term impacts, of being able to access all information at any given time, impacting on the work ethic and drive of future generations? This poster will endeavour to conclude on how opinions may have

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changed on technology within everyday education and children's lives, and whether it is having a more detrimental, than beneficial, impact on future generations or not.

Final year undergraduate (or third year for integrated masters courses)

Graph ML: Artificial Catalyst for Biochemical Research

Alexandra Herghelegiu The University of Sheffield

Machine learning has proven to achieve valuable results in the bioinformatics, as AlphaFold was recently declared to have solved the protein folding problem. Traditional deep learning algorithms handle ordered, uniform data, such as text and speech, i.e. sequences, or images, which have a 2D grid-like structure. However, a lot of the real-world data that is relevant to many of these biochemical problems is not naturally ordered, for instance protein-protein association networks and molecular graphs. Graph neural networks operate directly on this graph structure, performing tasks like node classification or edge prediction. GNNs generally aggregate node neighbourhood information via neural message-passing in order to compute embeddings for each node. There are additions to this model, such as attention mechanisms, which have already become popular in natural language processing. Applications of such methods can lead to astonishing insights. For example, a model which predicts an enzyme function based on its structure could be reverse-engineered to identify the enzyme's active site which led to that particular prediction. This is huge - it can speed up enormously the efforts of biochem researchers and ultimately solve great problems in healthcare, like finding treatment for newly discovered diseases. I am working with drug-drug interaction networks on which I predict yet unexplored effects of potential combinations of drugs. The ultimate goal is to develop more efficient treatment plans that will reach people much faster, by leveraging all the data we have. These algorithms can act as catalysts for this process and this is what truly excites me.

Ringy Stardust

Alexandra Stanhope Lancaster University

Interaction between particles in planetary ring systems such as Saturn's can lead to the accretion of small moons. Whether the moons form, and whether they are later broken or pulled apart, is governed by a variety of conditions. How many particles are there in the system? What is the minimum body size that we consider a moon? What is the mass of the

planet the rings are orbiting? Computer science can help model and visualise complex situations using simulations written in languages such as Processing. This technology allows people who are not necessarily skilled in computer science to make programs (such as simulations) that can be used in areas such as education and art. The project I have worked on develops the physical properties of the moons simulation. This work can be useful for both education and outreach work, showing and teaching people how ring systems are formed, and perhaps leading to easy-to-build prototypes for more sophisticated simulations that will help improve our understanding of the galaxy. This poster will present a simulation of a ring system, the challenges I faced while creating it, and analysis on how variable parameters affect the number and size of moons that are formed.

Interpreting Intelligence

Apoorva Patil University of Birmingham

From autonomous transportation to medical diagnosis, artificial intelligence has become all-pervasive. These models have long had the reputation of being a black box meaning you get the output for a given input with no idea of the reasoning that the system used. But a new wave of methods and techniques called Explainable Artificial Intelligence (XAI) is trying to change this. For example, a group of researchers trained a classifier to distinguish between photos of wolves and those of pet huskies. They then showed how the algorithm was basing its decision on the presence (or absence) of snow in the background and had no consideration for the features of the animals whatsoever. Not particularly intelligent huh! Thanks to XAI, the fact that this classifier cannot be deployed for use in the real world was discovered before it went out of the labs. Having an explanation comprehensible for humans behind the working of AI would have a number of benefits. It would help improve transparency making it easier to spot bias and discrimination, inform and support human decision making, enable debugging in case of abnormalities, allow auditing thereby making it possible to enforce rules and regulations around this technology, and close the loop between the stakeholders and model builders. This poster would introduce the concept of XAI, explain its need, give a brief overview of a few of the tools and techniques from this area, and state some of the challenges associated with it.

Human-Robot Interaction (HRI): Speech Therapy for Kids with Cleft Lip and Palate.

Aveen Najm Cardiff Metropolitan University

Cleft lip and pallet is a birth defect due to inherited genes and syndrome. Kids with cleft lip and pallet cannot pronounce some sounds like 'M', 'N' and sound that end with 'ING'. These sounds require space between nose and mouth to be closed. However, due to the incomplete structure of these biological parts, kids with cleft lip and pallet cannot pronounce these sounds. They are required to regularly visit to speech therapists, which is challenging during the Covid-19 pandemic. As a mother of a kid with cleft lip and pallet, I believe that technology like web based apps and speech therapist assistant robot can be helpful. Speech therapist assistant robot can be more affective compare to web based apps because robots are very interactive and kids love interacting with robots and can be remotely controlled by human therapists. My research is to design, and evaluate Robot XYZ, the speech therapist assistant robot. The requirements gathered during the investigation using questionnaires sent to parents of kids with cleft lip and pallet will be implemented by writing a speech therapy program for Robot XYZ. I will also evaluate and observe the primary interaction with my daughter and Robot XYZ. The findings and validations will be used to develop a model with machine learning and ethical integration, since there is a growing demand for speech therapy of kids with cleft, both at home and hospitals. This research can help to fill that gap in demand, especially during this Covid-19 pandemic

A random walk to the future - A comparison of computation time in a quantum world

Chloë Allen-Ede University of Wolverhampton

Quantum computers have gained great traction in the past few years with seemingly new developments in the technology every day. Companies like IBM took the lead in 2016 when they put their five-qubit quantum processor and matching simulator on the cloud for public use and the user accessibility has only increased since then. With promises of quantum computers having applications in areas of finance, medicine, business and more, it is important to test why a company would choose to invest in such expensive technology rather than existing solutions. One of the main selling points of quantum computers is the speed at which they can solve large problems. This poster will explore the special features of quantum computing technology, using IBM Quantum Exp as an example. We will focus on a comparison

of implementing the classical random walk using both quantum and traditional architectures. As randomisation is a key feature of computing applications, such as simulation and cyber security, we hope to illustrate the power and effects of this new technology in a significant number of fields. We will also consider some of the limitations of existing solutions and the barriers to be overcome before its widespread adoption and a future of quantum supremacy.

Cyborgs

Diana Rune Aberystwyth University

Imagine having a tireless body with more power than any Olympic athlete. A body where your health and age are determined by replaceable parts that make you. This movie-screen concept is closer to reality and more adaptable than anticipated. Robots exist today with the synthetic equivalent of human muscles. They can lift 1000 times their own weight and can grip a raspberry with preciseness and discipline, keeping it free from damage. Electro-active polymers, wound into fibres around a thin, soft centre, activate and tense when heat/current is applied. These polymers can also self-heal, thanks to an insulating liquid inside the material the electrode is wrapped around. In combination with neuroprosthetics that read brain signals in order to operate, we can control a synthetically muscular body with thought, like organic bodies. But they will be immune to sickness and fatigue, replaceable and customisable. Want an extra arm to carry your coffee and laptop at the same time? Some people aren't keen on replacing the flesh parts of their bodies, this is understandable. In this case neuro-controlled exoskeletons might be a suitable substitute, in order to increase the efficiency of walking, or to assist a paralysed limb. We live in an age where people live longer than ever. However, the older we get the more our quality of life diminishes and medicine hasn't kept up in making life comfortable for the elder generations. But age could become just a number and physical disability, a thing of the past, thanks to these rapidly advancing technologies. But are you ready to become a cyborg?

An Ontological Approach to Cybercrime Investigation Analysis

Dilpreet Kaur Gill The University of Southampton

The increasing severity of cybersecurity incidents in the current digital threat landscape is leading to an unprecedented future of cyber threat attacks. As attacks and investigations increase in complexity, digital analysts often have to rely on their past experiences and provide expert opinions or make swift decisions despite the lack of exposure or knowledge in the

situation. A collaborative approach between jurisdictions, organisations and nations could alleviate this problem. The lack of standardisation of data formats and forensic activities has created a barrier between jurisdictions and nations, aggravating the process of information integration and leading to the omission of critical evidence from investigations. Furthermore, the absence of an industry-wide common vocabulary or knowledge for representing digital evidence has led to large amounts of data in various locations, languages, formats and standards. To deal with the above problem, we will use ontologies. Ontologies provide a formalisation of the domain's information, serving as a common layer to build up knowledge bases and to derive new information through connections between these sources. Thus, the use of ontologies will remove the burden on humans in making sense of heterogeneous information sources. This project aims to use STIX (Structured Threat Information eXpression), an industry-known sharing standard for cyber threat information, and convert it into an ontology. We will enrich the ontology with information regarding a digital investigation and demonstrate how an ontology can help organisations and jurisdictions share and gain knowledge more effectively, thus aiding in their investigations.

The Appeal of Pink Noise: A Study on Arabic Music

Doha Moamina University of Liverpool

The appeal of music is universal, where almost every culture has developed its own musical styles and instruments, while influencing others. This motivated analysing music through many different contexts including their wave behaviour through spectral analysis. This method translates detected waves from the usual time domain to the frequency domain using Fast Discrete Fourier Transformation (FFT) in order to find their power spectrum. It was found that the most appealing music had a negative gradient to the power of -1 in their power spectrum, this gave rise to the name of $1/f$ -noise and is often referred to as pink noise. Furthermore, $1/f$ music is found in classical European styled music especially in compositions by Bach, and can be generated with random number generators such as Voss' algorithm (Voss and Clarke, 1978). However, it was not yet explored in cultures such as Arabic cultural music. This research will analyse Arabic musical recordings to find if they display $1/f$, which would test if this appeal is universal, then attempt to generate Arabic music using Voss' algorithm by generating pitches played by the violin, then adding Arabic Wazn which is a drum high-hat pattern (Touma, 1999). Finally, it will survey opinions of individuals from various cultures (mainly Arabic and European) to test if there is a bias towards one's own culture of music, or listeners would prefer $1/f$ music regardless of their cultural background, even randomly generated samples. Touma, H., 1999. *The music of the Arabs*. Portland, Or.: Amadeus Press. Voss, R. and Clarke, J.,

1978. "1/f noise" in music: Music from 1/f noise. *The Journal of the Acoustical Society of America*, 63(1), p.258.

Procedural Generation and Adaptive Difficulty in Video Games

Emilia Szykowska University of Southampton

In contrast to many businesses which have been badly affected by the COVID-19 pandemic, the video games industry has seen a massive surge in sales and engagement this year, especially in the last few months. 2020 welcomed the release of revolutionary consoles such as the PS5 and Xbox Series X, as well as outstanding games such as DOOM Eternal, Assassin's Creed Valhalla, Genshin Impact, and Animal Crossing: New Horizons. A persisting problem with modern games is the design of engaging environments and narratives. While games have seen a huge improvement in graphics and gameplay, developers are spending a huge amount of time designing internal systems. Environments are frequently designed manually, narratives are often designed as a fixed progression of events, and even new games like DOOM Eternal still rely on static difficulty levels. My game prototype is called Kingdom Battle and procedurally generates its environment and narrative, allowing efficient generation of diverse environments and stimulating narratives. The game will also adjust its difficulty over time to create an appropriate level of challenge.

Generative Artificial Intelligence

Esther Pearson University of South Wales

Generative Artificial intelligence uses existing mediums created by humans, such as poetry, books, or even images and audio files, and uses them to generate new content of which could be completely indistinguishable from human-generated work. Machines can learn and identify different underlying patterns at much greater depth than the average human, and use these to create new, yet similar content. There are various approaches of undertaking this, such as using transformers, variational autoencoders, and generative adversarial networks, or GANs for short. In the past few years, generative AI has come a long way and has gone from producing hilarious, ridiculous, and even disturbing creations, to more coherent and recognisable results. Uses of artificially generated poems include being used as an inspiration tool for poets, help marketing executives think of new tag lines for advertising campaigns, and have even help record labels to write new songs.

Titus Andronicus (Shakespeare 2.0)

Kiera Mascall Lancaster University

Predictive text has a reputation for being temperamental at the best of times (the top result after typing “why” into google is “why were chainsaws invented” - a good question if you’re an ardent fan of Texas Chainsaw Massacre, but possibly not as useful for more common folk). Thankfully, more advanced forms of predictive text exist and are widely used within natural language processing and artificial intelligence to produce works such as film scripts, newspaper articles and speeches. These pieces of work are often produced with varying degrees of success, especially as the subject matter becomes more specialised. One of the more challenging styles to attempt is Shakespeare; this is due to his unique literary style and use of Early Modern English, a version of English that differs in both spelling and grammar from the language we use today. The main goal of the project is to investigate methods of predicting text in particular styles, specifically Shakespearean language, and their success in doing so. We will use the natural learning toolkit in python to explore how inbuilt predictive text functions work and how we can use statistical language models to automatically build sentences in a similar style to Shakespeare. The program will be a simple command line tool that can either take several words as input and complete the sentence, or create a new sentence from scratch.

Virtual Online Shopping – Exploring Ecommerce from a wider angle

Laura Wilkinson Aberystwyth University

As we are currently going through a pandemic, online retail is as strong as ever. A way to support shops are to make a real time simulation of clothing – people are more likely to buy items if they can examine the clothing like they would before the pandemic started – this includes identifying the fit and colour for example. I will be using Virtual Reality to simulate high street shopping but from the comfort of home. This application will have two main sections – one of them to display the 3D clothing items on a mannequin – with a full 360 spin option and bookmark option. The other section will be an area to filter results and edit settings. The issues I’ll be exploring are how to design the application best for the user – avoiding common bad practices. These include avoiding motion sickness, ensuring intuitiveness and accessibility for users. I’ll be exploring adding subtitles, audio cues and adding UI options to increase font size for example. This ties in with the current COVID climate

because there are increasingly more restrictions which means they are unable to go to stores in person. I'm also interested in applications like this because I believe Mixed Reality should be used more in a commercial and training capacity. I feel as it can achieve more in these sectors and should have the opportunity to expand past the gaming stereotype.

Machine learning for analysing genome-scale metabolic networks.

Lilli Freischem University of Edinburgh

Numerous common diseases are related to a malfunction of the human metabolism as they are directly caused by cells lacking essential metabolites or metabolic enzymes. This discovery has stimulated research in human metabolism and its regulation. Drugs can influence the metabolic system by targeting enzymes that catalyse metabolic reactions. Since cancer is characterised by altered cell metabolism, metabolic network analysis can facilitate finding therapeutic targets that stop the growth of cancer cells whilst preventing toxicity to non-cancerous tissues. Metabolic networks are characterised well-enough to construct and analyse mathematical models of their behaviour at a whole-genome level. However, the different approaches to turn metabolic networks into graphs pose challenges as the chosen graph construction strongly influences the information gained from network analysis. This poster will explore how machine learning can help finding candidate reactions for drug targets when applied to reaction-based metabolic networks. More specifically, supervised learning will be used for predicting the biological essentiality of metabolic reactions using network properties as input features. Then, we explore the potential of semi-supervised and unsupervised learning on cells without known reaction essentiality.

Household Recycle Sorting Bin Design

Linda Scoon Bangor University

This poster presents the design of a recycle sorting bin that can fit in a kitchen and sort plastic, glass, metal, and paper recyclables into different bins through the use of physical sensors and machine learning. Research conducted in Australia, Canada and 10 European countries including the UK showed that the recycling frequency in urban areas is under-performing at 37%, compared to that of rural areas at 58% and suburban areas at 57%. Studies also found that some of the reasons individuals in urban areas choose to not recycle, are the perceived inconvenience and effort required to recycle. However slight improvements in convenience and a reduction in the effort required to recycle can drastically increase individual recycling

rates. Yet there are very few devices on the market that directly assist in the sorting of household recyclables. The presented design therefore aims to fill this gap. In the presented design, plastic and glass are to be identified by the sound the material makes when struck by a metal servo arm. The classification is done through the use of an Arduino library of a classifier, which is trained on the 'Edge Impulse' web application. Metal is to be identified by an inductive proximity sensor and paper is then sorted last by default when it is neither identified as plastic, glass or metal.

Monitoring Blood Oxygen Levels for COVID 19

Mrudula S Hirimagalur Swansea University

COVID-19 has had an unprecedented global impact over the last year, challenging societal norms and causing a devastating number of deaths. As we navigate the third lockdown in the UK, with the first one lasting 6 months, it is imperative that the public are focused on protecting themselves and others around them. This can be done through social distancing, tracking symptoms, and getting tested. As with any other disease, awareness of early signs of the virus massively increases the likelihood of a full recovery and minimises the number of people the carrier may inadvertently infect. However, a lot of people seem to be impervious to the initial symptoms such as fatigue and a drop in blood oxygen levels, leading to the virus spreading uncontrollably. Since the disease spreads through contact, doctors across the world are trying to diagnose early symptoms remotely without having to be physically present with their patients. Since access to resources might be limited in different areas, we must look at ways to create devices that can take these measurements at home. My vision involves creating a personal healthcare device that monitors blood oxygen saturation levels in an individual using an SPO2 sensor and Arduino, then mapping this data into a mobile application where it can be tracked. The intention is that the user will be alerted if their blood oxygen levels drop, which will encourage them to get tested early, thus reducing the danger towards the individual and others whom they may come into contact with.

Expressing Artificial Intelligence: Interactive Drama

Niamh McConville University of South Wales

Artificial intelligence systems open state-of-the-art possibilities in interactive drama and entertainment, providing a powerful interactive adventure. In recent years, there has been a surge in the implementation of interactive games with autonomous roles exhibiting real-life

emotions with an excellent ability to mimic social interactions. Successful interactive drama is achieved when the user enjoys a personal experience as a character in a storyline. Certain algorithms are required to be implemented for the user and are essential when combining interactivity and narrativity. For an interactive drama to be popular, users must be presented with a variety of options and potential narrative paths to anticipate the future possibilities these actions could propose. Numerous interactive dramas have been founded on these fundamental factors, creating an engrossing and exciting interactive storytelling experience that continues to pave the way for future innovation. This poster analyses many different examples of interactive storytelling including the most popular facade, which has gained its admiration for remaining infamous within the interactive storytelling community. Nevertheless, interactive drama continues to prosper, with developers searching for solutions to the barriers holding this form of entertainment back. The high level of interactive freedom experienced during this form of entertainment clashes with discoveries not yet unearthed; currently making one of interactive drama's greatest attributions, it's largest limitation. We will delve into Artificial Intelligence through Interactive Drama exploring its impact on real-world society and human behavior whilst also touching upon solutions to the challenges through methods and algorithms.

Experiential Learning: Educational Robotics

Noorafsha Manga London South Bank University

In the 21st century, it is more important than ever before that young people of all backgrounds are ready and prepared to tackle future global challenges, for this, it is vital that they must acquire conceptualising, problem-solving, and collaborative skills to succeed in their endeavours and aspirations. Technology partakes a fundamental role in the assimilation of these skills. Amid flourishing arrays of technologies, robotics stipulates challenges and opportunities to the learners in disruptive thinking, higher order thinking, and growing innovative ideas. Deemed as too "challenging and boring" when learned through the "conventional" theoretical method, by having to program and direct a physical robot and acknowledging errors in computing, students learn the dos and don'ts of what a robot can do with an immediate understanding through experiential learning. The project investigates the educational use of robotics in schools and how teachers can incorporate this innovative technology into the syllabus. Exploring whether new technologies simply reinforce old ways of teaching and learning, the barriers to making robotics education more accessible, and different steps that can be taken to reduce these barriers where possible. It also proposes effective approaches in using robotics as an educational tool and how it will impact students'

interests in STEM education. With the growth of robotics education and other emerging education technologies, the future of education is looking out to be extremely exciting.

Developing Images Through Robotic Arm

Sapphire Williams Bangor University

This project is all about exploring a way to print out a picture from your device using a robot arm. I'll be researching online into different ways in developing this and researching separate articles to see what products have already been done. I will also be exploring things other than articles, books, similar work that is the same as my topic for my third year project. I'll be doing this by buying a cheap robotic arm, this will be purchased on Amazon. Then I will have an Arduino, the reason for this is I'll be using the Arduino to control the robot arm that I have built by using the software on my laptop and writing out the code in the software to make the arm move. There will be small little steps when doing this, like I'll start off with making a circle, then moving onto making a square and so on. Each step will develop into a different shape and then moving on developing a picture onto a piece of paper using the robot arm. The aim for the outcome of this project is having a fully functional working arm being able to make the shapes I want it to by coding it into the software that I have picked. Even if it will not be able to print out the exact image, I want it to, it will be able to produce something even if it is a few shapes. As I have said before the reason for the Arduino is so that it can produce these things.

The Use of Evolutionary Algorithms and Agent-Based Modelling in Decision Making for Tackling the Spread of Novel Coronaviruses

Sara Wilson University of Stirling

The COVID-19 (SARS-CoV-2) outbreak has brought about unprecedented changes to everyday life and affected or taken the lives of many people around the world. The long-term economic and educational damages are hard to estimate but there is no doubt that it has changed the way that nations consider their protections against such an epidemic. Many areas are ill-equipped to deal with such a large-scale and relatively lethal outbreak whether due to tight budgets, overpopulation, or other similar factors. For this reason, it is crucial to understand exactly how, and in what circumstances, coronavirus can spread most easily, and what can best be done to combat it. The use of a modelling tool is one of the best ways to achieve this. In conjunction with the use of an appropriate evolutionary algorithm, we can generate data

which helps to paint a picture of what the most effective method of tackling the spread is, based on the size, age, and mobility of the population. This can be accomplished using a cost function, where certain procedures such as PPE are more expensive to implement than social distancing; this means that we are able to identify a solution which keeps the total number of deaths to a minimum, while also reducing the total costs involved.

Sustainable and diverse ice

Sarah Clowe Keele University

Sustainable and diverse ice. In the last 50 years space exploration has advanced rapidly. But there is still research and experimental ways to explore space, which us humans can achieve. In the past few years the world had been focusing on EDI and sustainability, which I will be demonstrating how these topics can be implemented within the domain of space exploration. I will be discussing the sustainable ways we can explore space and looking at some of the ethical ways we can improve space exploration. Such as looking at the structure of rovers and replacing the bodies with ice which is more sustainable to use in space. I will also be discussing the EDI (ethics, diversion and inclusion) of the AI which could and will be used in the future, not just in autonomous robotics but also in health and more. These AI's like humans have to learn, evolve and they need the right data sets in which to do this. This poster will demonstrate how autonomous ice robots can be sustainable within the domain of space exploration and how the AI for these robots will be trained going by AI ethics including EDI. This poster will discuss both experimental research which hasn't been achieved yet as well as research which is currently being implemented into everyday scenarios.

Creativity as an Outcome for Computer Science Students

Vanshika Saxena University of Warwick

Creativity is barely discussed as an outcome in Computer Science (CS) education. Instead, the focus is on the accumulation of knowledge and technical skills, which alone is not sufficient to prepare students to address complex challenges in an ever-changing world. Few studies that have looked at creativity in CS have explored it in terms of aspects and components. This project looks at how creativity can be conceptualised in CS higher education from a systems perspective. The study uses a design science research approach to develop a model for understanding and enhancing creativity as an outcome in CS education, with a practical demonstration of how the system can be improved. Interviews and focus groups were

BCSWomen Lovelace Colloquium 2021: Abstract book and programme

conducted with staff and students at the Department of Computer Science at the University of Warwick to analyse how creativity is situated in the interaction between staff, students and technological support systems. In the interaction between staff and students, issues around the prescription and assessment of creativity and varying student expectations were found to be factors that can be seen as 'locking' the system in a lower level of creativity. A 'stack' of levels of creativity in CS education is proposed as a tool for enhancing creativity in the system, with recommendations for how the interactions between staff, students and technological support systems can be improved. Furthermore, an application is developed to demonstrate how technological support systems could be improved using this model.

MSc (or final year for integrated masters courses)

Personal(it)y, I'd recommend _

Alexandra Krajewski Durham University

Providing users with relevant and high-quality recommendations is a significant task due to the staggering amount of information that we have access to through the internet. Systems find themselves with cold-start problems when accepting new users with sparsely filled data sets. A popular approach to making predictions is the use of collaborative filtering, which relies on trend correlations of users. If a user A rates a set products similarly to user B, it is likely user A will enjoy other products that user B enjoys, even if they have not tried them before. These correlations have the potential to strengthen once contextual factors are accounted for, as well as mitigating the effects of (new) users without many previous ratings. Through using contextual data pertaining to a user's demographic, location, or affect, we can begin to build a richer profile for a user that could guide our system to provide better quality predictions. While the strength of demographic information is not to be disregarded, it has been shown that affective or personality-related contexts have the potential to be even stronger indicators of preference, providing better quality recommendations in certain domains such as music and travel. Furthermore, personality-aware recommenders in music and education frequently display results of higher accuracy than demographic information if used alone. This poster will investigate the effects of personality in a recommender domain that is currently lacking significant contributions.

Software Moving Accelerator Science Forward

Anna Bielinska Oxford Brookes University

Hundreds of scientific laboratories around the world are using computers to move the forefront of our knowledge forward. All modern technologies have their roots in the labs. Probably, the best known example is the Internet itself having its roots in the particle physics laboratory at CERN. I will provide an overview of software tools and strategies currently in use in the major European and UK particle accelerator labs. There are a plethora of challenges faced by scientists working with particle accelerators. Many problems are solved with the help of a special software. First, a design of a modern accelerator requires software capable of modelling the behaviour of quantum relativistic particles moving in external electromagnetic fields with incredible precision. Second, one needs special software to deal with information about billions of particles colliding in an accelerator per second. Modern detectors can

measure parameters of virtually all products of such reactions generating gigantic volumes of data. Dedicated software tools are necessary to analyse such data. In addition, an important issue is the preservation of data from earlier experiments which may be needed later to verify new hypotheses.

Intelligent Technology and Ethical Responsibility

Annette Reid University of Bath

When considering ethics and regulation of intelligent technology three groups must be considered: governments, developers and users. Each group is responsible for the ethical use of intelligent technology. Governments are responsible for determining the place of intelligent technology in law, commerce, and society based on human progress, protecting human dignity and increasing economic growth. They must produce legal and ethical guidelines for developers and users to follow. Developers are responsible for following any industry standards and laws when developing intelligent technology for use in any context. Ethical challenges when developing intelligent technology can be five main areas: beneficence, non-maleficence, autonomy, justice and transparency. Each of these areas creates unique challenges such as protecting human dignity, data manipulation, and human control, which developers must reason about and balance while creating or expanding intelligent technologies. Users must be made aware of the ethical issues surrounding any intelligent technology they are using and the context in which they are using it. They must be able to spot and deal with ethical breaches that may occur. Overall, all three groups are responsible for the ethical development and use of intelligent technology in society.

Machine Learning applied in the context of Question Generation and Question Answering

Chloe Thompson Queen's University Belfast

Question Answering (QA) and Question Generation (QG) have been prominent in language modelling research and a focus area within Natural Language Processing (NLP) for a number of years. A large contributor to this, is the increase in the use of Chatbots, where users are requiring more intuitive, conversational interactions that can understand their requests. Question Generation is the task of generating questions given a context paragraph, whereas Question Answering is the task of returning an answer from a given context paragraph and

question; however, both processes can be closely linked. There have been a number of developments in NLP models in the past years, with the introduction of the approach using Embeddings and Transformers. This project aims to understand and demonstrate the use of NLP models, specifically BERT and GPT-2 variations, in Question Answering and Question Generation tasks, and how the training data used affects the outcomes. The results will revolve around the analysis of accuracy metrics which will indicate the competency level of Question Answering and Question Generation models, which are both trained on two different datasets for comparison. These metrics will enable the understanding of model enhancements to be performed via hyper-tuning. The final aim of this work is to produce, evaluate and deploy QA and QG models which can produce lexically and grammatically correct responses for each task respectively.

Unifying Games and Education in an Increasingly Online World

Christina Moir University of Abertay

The use of games within education is a slowly developing area within computing. However, with the rise of the current pandemic we are seeing more and more children needing to be home-schooled due to school closures or self-isolation. Although some learning is being done through online classes with teachers, the majority is left to the parents who may not have time nor the knowledge of how to help or effectively keep their children's focus on their work. This is where the gamification of education becomes increasingly useful. By turning learning into games children are more likely to stay focussed, spend more time on their school-work, and there is even the potential for the learning to be more effective. This would also alleviate the stress on parents as well as teachers who could view their progress through game 'achievements'. This would be a helpful area to develop further even for when schools can resume normally as children these days are very technology focussed. Most young children have access to a smart phone, gaming console, or tablet and use these at least once a day. Being able to include games which are inherently teaching them necessary life skills (e.g. problem solving, communication, language) would be of a great advantage to a child's development.

Functionality and Criticality Analysis of Type II Diabetes. Developing a machine learning algorithm for diagnosis of disease through gait analysis

Egle Arge Oxford Brookes University

Is there a different way to think about the dynamic complexity of biological systems that will allow for novel diagnostic methods? Statistical physics has introduced the concept of self-organising criticality to the biological world and criticality analysis of many different biological systems from neural networks to flocking birds has been successfully applied. The basic premise is that the systems balance not to equilibrium but between phase states of interaction and chaos. A good example is the study of neural networks. Stimulation of a neuron leads to a chain reaction (or avalanche) within the localised or more distant neural network. Too little stimulation leads to an insufficient excitation of neighbouring cells and no signal is propagated. Too much stimulation leads to unregulated chaotic stimulation of the global network causing seizures. It is becoming increasingly apparent that many metabolic and biochemical pathways demonstrate this self-organising criticality behaviour. External stimuli cause reaction and interaction within the system in response to the stimuli -just as with equilibrium models – however, the rate of change towards a chaotic state from such external stimulation is controlled by key highly connective elements in the system. The individual components of each system have little impact, but the wider implications of interaction can have global system effects. In this study it is proposed that the global effect on people suffering with type II diabetes is a change in the gait and bipedal movement compared with normal populations. Is it possible to elucidate which are the key internal elements that can be qualitatively modelled to produce a machine learning algorithm sophisticated enough that a digital representation of someone walking is enough to diagnose, not only their disease, but the extent of their pathology.

A screen that could change “destiny”: is distance education the key to educational equity?

Ellie Ye Cardiff University

Due to the Covid-19 crisis, most learning has moved online, remote education has never been more important than it is today. Some top-ranking schools actively share their courses and lectures, making it possible for disadvantaged pupils to access quality content online in order to reduce the allocation gap of education resources. However, is distance learning really

effective in enabling knowledge flows classless? A large number of online courses from leading universities are tailor-made for their students, aiming for further improvements based on available knowledge. These courses are unlikely to be absorbed by students who have insufficient education. They are not only caused the struggle of students to learn on their own but also created the inferiority feeling by comparing with other talented students. Moreover, although web-based lessons can replicate the knowledge, it is difficult to replicate the engagement between teachers and students, and the desire to learn. Therefore, how can remote learning best fill the gap of inequality education? Perhaps providing the course in an integrated, holistic and systemic manner to lower the threshold for students and use available technologies to simulate a real classroom environment to increase interactivity. This poster will discuss the challenges that distance education faced as well as the potential solutions.

The human patch: Overwrite genes with Machines!

Hemasundry Ramasamy University of Birmingham

In recent years, the number of people diagnosed with cancer has been increasing exponentially. It occurs when normal cells are transformed into tumour cells through a various-stage biological process which includes mutation, insertions, deletions, and structural rearrangements, etc., that eventually results in cancerous development. These variations happen as a result of a person's genetic factors as well as interaction with several environmental factors. Thanks to the advancement of genomics and precision medicine studies. Gene therapy is becoming one of the latest options for treating cancer cells by altering the mutations in driver genes or delivering the functional gene. Though it sounds astonishing, the success rate of gene therapy relies on targeting the right tissue and cells. If the target is missed, then gene therapy becomes a curse as it will favour secondary mutations in the DNA - resulting in severe cancer progression. Machine learning (ML) and artificial intelligence have shown great success as methods to treat genetic diseases and are critical for the advancement of gene therapy. ML algorithms are developed by identifying patterns in large datasets and then are translated to human models to analyse the impact. In addition, ML can also be beneficial in predicting potential sequences to alter mutations in CRISPR gene editing tools to rectify gene imperfections and further cure the diseases. Used together, the implementation of ML/AI in gene therapy has the potential to treat many major genetic diseases such as Alzheimer's, Type 1 diabetes mellitus, type2 diabetes, and Cardiovascular disease. In the near future, researchers will be able to create further gene therapies with the aid of computationally intelligent techniques that can provide solutions to cancer and genetic disorders.

Information Retrieval for a Personalised Language Learning Experience

Kitty Ho Birkbeck University

The popularity of applications such as Duolingo has shown that there is a market for making language learning more accessible. We explore another way of making language learning more accessible: by employing ontology-based information retrieval techniques to create personalised study tools. We aim to personalise the language learning experience by building a set of study tools and curriculum based on a user's responses to questions about themselves, such as about their occupation, personality and interests. In this way, we prioritise terms that apply most to users' lives and are thus more likely to be both immediately memorable and practically useful. We also aim to automate the process of creating study tools—to make studying more efficient, less time-consuming, and thus more accessible. Semantic similarity will be applied to compile a list of words and phrases semantically related to the user's responses and in the language of study. From these search results, our intention is to use a simple Boolean search to retrieve whole sentences to help the user further learn how to apply the term or phrase in context. Our programme will convert the retrieved words, phrases and sentences into user-friendly study aids, such as presenting them as flashcards in a GUI. The quality of the search results and of our programme will be evaluated with standard metrics for information retrieval, such as the precision rate, to assess how far the generated results match the user's needs.

An Investigation of Perception and Anthropomorphic Preferences of Social Humanoid Robots for Mental Healthcare.

Linh Dong Cardiff Metropolitan University

Mental health is an underestimated and ignored issue despite being one of the most contributed factors to the world's burden (Whiteford et al., 2013). The current situation of the global pandemic COVID-19 also has a severe impact on people's mental health around the world (Holmes et al., 2020). Meanwhile, the significant transformation of the Fourth Industrial Revolution allows social humanoid robot (SHR) to emerge and prove its potentiality, especially in the healthcare sector. Yet due to poor and negative portrait and stereotype caused by the media, it is concerned if people are willing to trust and accept robot into their daily life. As one of the contributing elements to the formation of robot trust and acceptance,

anthropomorphism is a research area that receives a lot of interest. Because previous literature indicated that human-robot interaction will be as intuitive and natural as human-human interaction if robot has anthropomorphic or humanlike features. The aim of this research is to develop a robot anthropomorphism framework with human-centred design principles by evaluating current social service robots which have been introduced to the public. The research outcome would provide useful guidelines for researchers and roboticists for further investigation in the future, on the improvement of human-robot interaction and the implementation of SHR in mental healthcare.

Chinese Adoption Database

Mia Coupland Newcastle University

Being an adoptee often poses many questions and carries an emotional burden, especially for those adopted internationally who usually do not know their background. The Chinese website, 'Baby Come Home', was created to help reunite displaced Chinese families, however, the language barrier makes it difficult to navigate for adoptees placed in the west. I am aiming to create a non-profit multi-lingual database to facilitate adoptees searching for their birth parents and vice versa. There is currently no website that targets adoption specifically. Adoptees may enter their data into genetic testing websites, such as 23andMe, but the choices are numerous and western sites do not have such extensive data on China and other non-Western countries. A specialised system must be created that is accessible for both adoptees and birth parents and supports translation. It should be able to search other common genetic testing websites for matching genetic data both in China and the West (We Gene, GED Match, et cetera) and be a central hub for seekers. It would have a forum and the chance for adoptees and birth parents to connect more informally and share extra information, with some moderation. Chinese international adoption groups are scattered and limited in resources, but this database could address the most pressing issues, created by those who need it most and therefore have the best understanding of the requirements. The website could be made using standard web technologies with a MySQL database. Of course, the scale of the project has room to grow with the user base.

Bio-Electra: A deep neural language model for Biomedical Question-Answering

Molly Hayward Durham University

Medical information and research published in online journals is high in quality and incredibly valuable to society - hence, to best utilise this information, it should be easy to filter and query. Question-Answering techniques aim to solve problems like this; in extractive question-answering, a question and a context paragraph are provided as input and an answer is extracted from the context paragraph. Advancements in biomedical question-answering research have the potential to vastly improve access to reliable health information; this could allow healthcare professionals to query published literature quickly and could widen access to help tackle misinformation in the rest of society. In recent years, large transformer-based language models have dominated question-answering (QA) research, revealing a strong correlation between performance and greater access to resources such as computing power, training time, and quantity of training data. In a closed-domain setting such as bio-medicine, data is less abundant, therefore a more data-efficient technique is required. Furthermore, publicly released pre-trained weights of popular models do not translate effectively to biomedical QA. As they are pre-trained on general-domain text; hence, they have less specialised vocabularies that makes them unsuitable for specialist questions. This highlights the scope for developing a specialised language model, capable of understanding the nuances of biomedical text and of learning quality information from smaller quantities of data. We implement the BioELECTRA model, based on ELECTRA - a language model that maximises learning in resource-constrained settings. We adapt ELECTRA for the biomedical domain by pre-training on medical corpora and fine-tuning on biomedical question-answering.

“Deceive the deceivers and learn from them”: Implementing a Deception-Enhanced Intrusion Detection System (IDS) with Machine Learning

Nadeen Habaybeh University of York

With the huge rise in cyber-attacks, the traditional IDS became inefficient. This is due to the high rates of false-positive and the large number of meaningless alerts that are continuously bombarding and misleading security analysts. An IDS, specifically the anomaly-based one, usually mitigate threats by sending alerts when any deviation from the normally observed behavior is detected. The use of deception in intrusion detection can be a practical strategy for effectively reducing the rate of false positives, and building a more powerful defense mechanism. While the concept of deception in cybersecurity has always been mapped to the static honeypot, these conventional deception techniques were completely separate from data streams at which intrusion detection happens. However, the idea of deception has been extended to include more dynamic and active interactions with attackers in isolated decoy

environments. Typical IDSes are missing a learning opportunity every time an attack is stopped at an early stage. When integrated with machine learning, these systems usually suffer from the scarcity of realistic and recent training datasets. Therefore, deception can be particularly helpful in training and updating machine learning models used by the IDS. The poster will outline the importance of fusing deception with machine learning in order to improve IDSes and to provide early insights about various adversarial behaviors and zero-day attacks. Additionally, the methodology intends to provide an inexpensive solution that will reduce the involvement of humans in the intrusion detection process while allowing security teams to focus on other crucial matters.

Digital Twins: unicorns, engines, and countries

Poppy Harrison University of Bath

The term Digital Twin is a significant and topical buzzword. Ask even a well-informed group for a definition of a Digital Twin and you are likely to get different responses from all of them. There's a complicated history and science to Digital Twins but, at their simplest, they are a digital replica of a physical entity. As a definition, this leaves much to be desired, but with varying levels of maturity, a Digital Twin can range from a simple model of a component to a fully integrated, dynamically-linked model capable of enabling concepts such as machine learning and artificial intelligence, relating to an assembly line, a power plant, or even a country. In the UK, the Centre for Digital Built Britain is thinking about a National Digital Twin – not so much a single construct, more a network of interconnected Digital Twins. There are huge potential benefits to this. A report, “Data for the Public Good” from the National Infrastructure Commission, highlights examples such as predictive planning – how would a population increase affect transport requirements? Digital Twins are a hugely encapsulating topic and bring to mind Bill Gates’ words: “We always overestimate the change that will occur in the next two years and underestimate the change that will occur in the next ten.” Digital Twins might not be everywhere today, but for how much longer will that be true?

Eat well. Feel well.

Sara Cristofolletti University of Bath

The total burden of foodborne diseases on the UK population and economy remains unacceptably high, and although many patients recover quickly and fully, vulnerable people may suffer through secondary (and lasting) effects or even fatalities. This is exacerbated in the

current climate: COVID is having an unprecedented worldwide impact in both health and socioeconomic terms on the national (and global) food systems. For anyone actively concerned about their wellbeing on this aspect, that's when our control monitor comes to the rescue! The app works like most of the nutritious ones available online, prompting the user to record their meals and food items consumed during the day, which would be saved and catalogued by the AI system, to be analysed in conjunction with medical information provided by the user further on. However, it also contains an element of prediction and organisation, allowing the individual to compile a list of food products to be obtained in the future, with the option to confirm their purchase once achieved (for example, at their arrival at home). This way, the app would record the food products physically available, providing healthier suggestions for the future, supported by the available medical history. The second feature of the app is its medical component. If the individual was feeling unwell, the interface would prompt the user to input symptoms about their condition (ranging from fatigue and nausea to vomiting and diarrhoea), if willing to. This would allow the AI mechanism to speculate on the cause of the foodborne disease without the need of appointments and invasive procedures. Medical information, including typical symptoms, incubation/onset periods and causes of disease, are saved as a code library, which the app would then use to compare the user's symptoms to. As the symptoms progress, the device would provide suggestions on potential causes and the option to contact the NHS or their personal GP, if needed. Finally, as they would have the freedom to disclose all and any information about their diet and medical history, risks on privacy concerns would be minimised.
