

2019/2020 CA115 - Digital Innovation Management & Enterprise

- Final Aggregated Blogs -
- Nicolas Oyeleye -

As part of my studies of Digital Innovation Management & Enterprise, I was required to write weekly blogs after attending each lecture. Below is my final aggregated blog which consists of all my previous weekly blogs combined.

Media Analytics

Dr Suzanne Little

Understanding video content



In this Blog I will discuss what I learned from the lecture on the 6th of February 2020, about Media Analytics given by guest speaker Dr Suzanne Little.

The lecture started like any other, with an introduction. Dr Little began by explaining the different terms that fall under 'media'. She then introduced the topic 'Media Analytics'. From my interpretation I understand Media Analytics to be, 'gathering data to track and improve performance'. The idea of Media Analytics is fascinating; however, practicalities can be challenging. Writing things on paper is easy but testing and experimentation can be difficult, especially when dealing with humans.



Dr Little explained how computers are being programmed to “see”. Computers are being taught how to understand different scenarios. However, this approach is quite challenging as computers can’t understand abnormal scenarios.

Semantics is the study of a relationship between words and how we construct meaning. The term Polysemy falls under Semantics. It simply means, ‘the coexistence of many possible meanings for a word or phrase’. A sentence could be interpreted differently by different people. Without specification the real meaning is never known. If I ask for a round orange ball, what do I mean? Do I want a tangerine, an orange football or the sun? It could be any one of these objects. No one would know unless I specified further.



Similarly, computers can’t use initiative, which is what makes it hard to teach them. We must be specific when giving computers instructions. This might seem easy and doable but there are an infinite number of abnormal scenarios that could occur. This makes teaching computers how to “see”, quite difficult.



I learned in the lecture that visual similarity and semantic similarity are not the same thing. Two things can have the same physical properties but that doesn't necessarily mean they are the same thing.

Visual Similarity \neq Semantic Similarity

Supervised Learning is the machine learning task of learning a function that maps an input to an output based on example input-output pairs. Supervised Machine Learning uses labelled examples to train computer systems. This training is used in cars, to aid the driver with parking. It is also used to diagnose abnormal voltage.

In summary, Media Analytics has many potential applications. These include health, broadcast media, entertainment, sport, agriculture and so much more.

More on Media Analytics:

- <https://www.nielsen.com/eu/en/solutions/capabilities/media-analytics/>
- <https://matomo.org/docs/media-analytics/>
- https://en.wikipedia.org/wiki/Social_media_analytics

Design Thinking



This blog is all about design thinking and how we can use it to innovate the tech industry. This blog will highlight a general solution to try and counteract wicked problems.

Innovation

The first question we should ask is, what exactly does the term “Design Thinking” mean! Design thinking is an intellectual process of looking at a problem and designing a better outcome. In simpler terms, we look at an everyday problem, we decipher what the key factors of the problem are, and we then try to find a solution to relieve the problem.

Design thinking is undoubtedly one of the most in demand skills in the workplace. Many employers want someone that can come into the workplace and boost the rate of innovation.



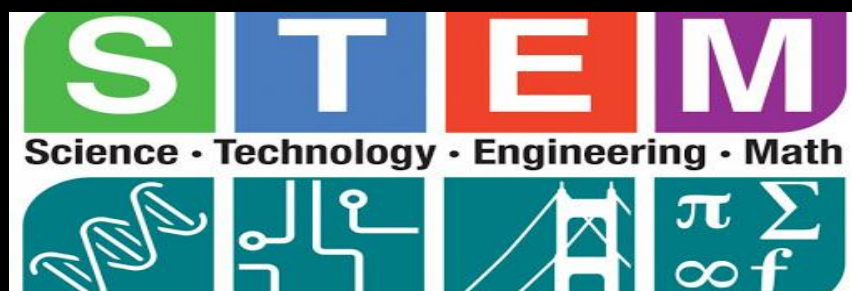
According to a survey by McKinsey & Company, 84% of CEO's believe innovation is the biggest challenge facing their businesses. They are afraid that if a new company was to transform the game their businesses wouldn't survive. In the same survey by McKinsey & Company, 94% of business don't believe that they have the people and the know-how to win at innovation.

Tech Businesses these days are known to have a VUCA environment. VUCA in this case is an acronym for Volatile, Uncertain, Complex, Ambiguous. VUCA defines the risk involved in decision making in tech businesses. It consists of what Dr Peter Robbins describes as, "A tornado of uncertainty".

Consumer Research



In the past we have focussed too much on the STEM subjects as opposed to the arts. What we have concluded in terms of innovation is that, Data analytics brings you to common ground. If most businesses are looking at the same thing, using the same approach, they will inevitably arrive at the same conclusion.



This is where Consumer Research comes in. Consumer research is the action of gathering information about consumers' needs and preferences. Consumer research is crucial in tech innovation. A lack of consumer research can lead to innovation failure. Failure at innovation is much more common than success. Everything decision made is a risk. Consumer research can reduce that risk but like most things the system isn't fool proof.

Wicked Problems

A simple or tame problem is one that can be solved by choosing and applying the correct algorithm. You know when it's complete and the problem is solved. A wicked problem on the other hand has no right answer or solution. Generally, the problems are multifactorial and multi-layered.

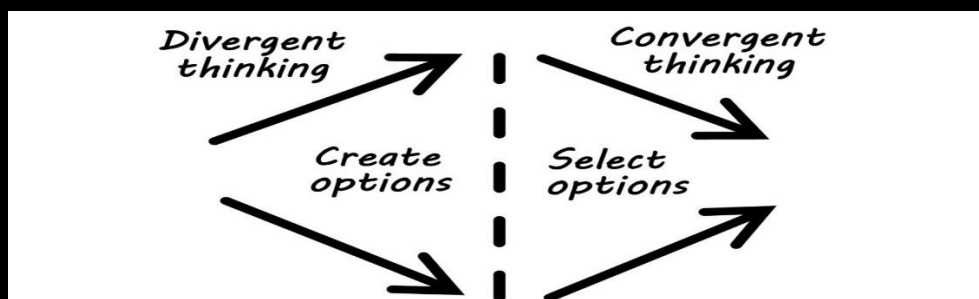
When dealing with wicked problems, the main problem is rarely the actual problem but, concluding on what the actual problem is. Many people don't fully understand the problem before they dive into it. Without understanding the problem, it is very difficult to attack it.



Once You understand the problem it's time to implement design thinking. As previously mentioned, design thinking isn't about all about solving problems. It entails looking at a problem and designing a better outcome.

"If I only had an hour to solve a problem, I'd spend 55 minutes defining the problem and only five minutes finding the solution." ~ Albert Einstein

Divergent thinking is a thought process or method used to generate creative ideas by exploring many possible solutions. In order to think divergently, you must allow all ideas. No ideas are "silly" in this process. The aim of this way of thinking is, to generate as many possible ideas as possible.



Convergent thinking on the other hand is the type of thinking that focuses on coming up with the single, well established answer to a problem. It is a process of elimination. This is where we narrow down what would work. In this type of thinking there are "silly" ideas, and this is where we get rid of them. Although wicked problems can

never actually be solved convergent thinking can help in getting to the best solutions to improve the problem.

Summary

Innovation is the future, but many businesses and companies are too afraid to do anything outside “the norm” because they don’t want to fail. In the business industry is a case of “Innovate or Liquidate”. If all these businesses are following each other, we get a case of Imitation rather than innovation.

Design thinking provides of catalyst for the rate of innovate. If many more businesses used this approach a significant amount of our day-to-day problems would be restrained.



For more information on Design Thinking and Innovation visit:

- <https://www.interactiondesign.org/literature/article/what-is-design-thinkingand-why-is-it-so-popular>
- <https://www.ideatovalue.com/inno/nickskillicorn/2016/03/innovation-15-experts-share-innovationdefinition/>

Building the Hydrogen Economy

Dr Gary Mc Darby

“Never doubt that a small group of thoughtful, committed, citizens can change the world. Indeed, it is the only thing that ever has.”

Margaret Mead



Liberia, officially the Republic of Liberia, is a country on the West African coast. It was used as settlement for slaves after slavery ended. When the ex-slaves arrived, they started looking for land to settle on. The locals got agitated and, inevitably, a civil war broke out.

Children were being used as soldiers during this period. The reason behind this was the fact that “no one wants to kill a child”. Rivals were hesitant to attack the child because of their innocence.

Dr Mc Darby was in Liberia at the time and witnessed these children being taken advantage of. During his stay, he encountered a child soldier named Prince who was suffering from PTSD and having trouble sleeping at night. Mc Darby had a Sony Walkman – a music player made in the 1990s. Suddenly, he had the idea to let Prince listen to music on his Walkman as a way of helping him sleep at night. After seeing that this was effective, he realised that technology could play a profound role in helping people.

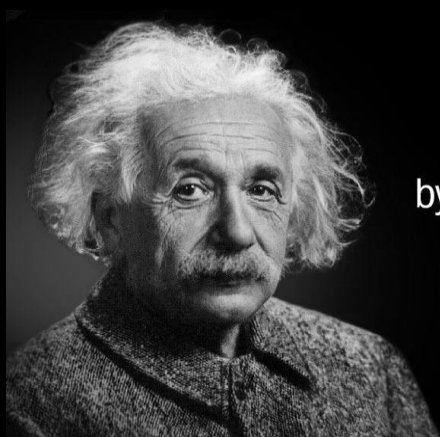


As a result of this moment of realisation he decided to team up with other scientists including psychologists, engineers, artists and computer scientists.

Innovation

They developed a two-player video game which improves one's ability to relax during moments of stress and anxiety. The aim of the game is to relax as much as possible – the more you relax, the faster your dragon flies and wins the race. The better you become at the game, the better you become at handling stress.

What Dr Mc Darby learned from this experience is that bringing people from different faculties together can encourage innovation. The reason for this is the fact that all these people were experienced in various areas.



Everybody is a genius.
But if you judge a fish
by its ability to climb a tree,
it will live its whole life
believing that it is stupid.

– Albert Einstein

AZ QUOTES

Innovation, as Dr Mc Darby stated, is an intrinsic part of being human. In life we either “Innovate or Liquidate”. Innovation can start from anywhere and by anyone. It is necessary for change and is particularly important during a crisis

Good innovation is almost measured by how much resistance it creates. As George Bernard Shaw once said;

“All great truths begin as blasphemies”

The Hydrogen Economy



Hydrogen is a colourless, odourless element which is also very light. Hydrogen is the only atom for which the Schrödinger equation has an exact solution. It is the most abundant element in the universe. It burns with an invisible flame and was used as

fuel for aircraft. The production of these planes was stopped in the 40's as a result of the Hindenburg crash in 1937.

The main sources of hydrogen are:

Water

Fossil Fuels

Biomass reactions

Chemical processes

For more information on Hydrogen Sources, visit:

<https://www.energy.gov/eere/fuelcells/hydrogen-resources>

Uses of hydrogen are:

Fuels for flights

Fuel Cell vehicles

Energy autonomy

For more information on Hydrogen

<https://energies.airliquide.com/>

Empowering Citizens Smarter Societies

Dr Aoibheann Bird

In this blog I'm going to talk about what I learned from Dr Bird which is, what a smart city is, how microcosms of it can be adapted and used in various aspects of life data analytics in relation to our cultural heritage.

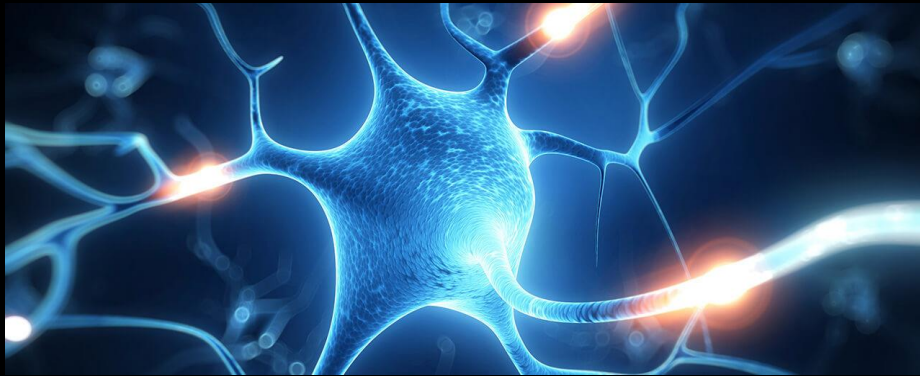
A Smart City



A Smart city is an urban area that uses different types of electronic Internet of Things (IoT) sensors to collect data and then use insights gained from that data to manage assets, resources and services efficiently. Data Analytics is the fundamental factor of smart city. It is also used in health management, sports, flood management.

The most common example of data analytics to do with smart city is, crowd behaviour detection. This technology is amazing in deciphering chaos in towns and cities. It detects violence like mass fights or street protests and almost immediately informs the police. The adaptation of this technology can help us make informed decisions. For example, these computers can differentiate between pillow fights and serious hate violence. In the case of pillow fight the police won't need to be involved as it is not serious.

Neurological Diseases



One microcosm of a smart city is the production of wearable sensors for patients with neurological Diseases. This technology provides memory assistance for people with the likes of dementia or Alzheimer's disease. It addresses cognitive problems. For example, a common problem for a lot of families with relatives suffering from neurological diseases is the fact that they forget a lot of stuff. This can be names, faces or even important information. This technology

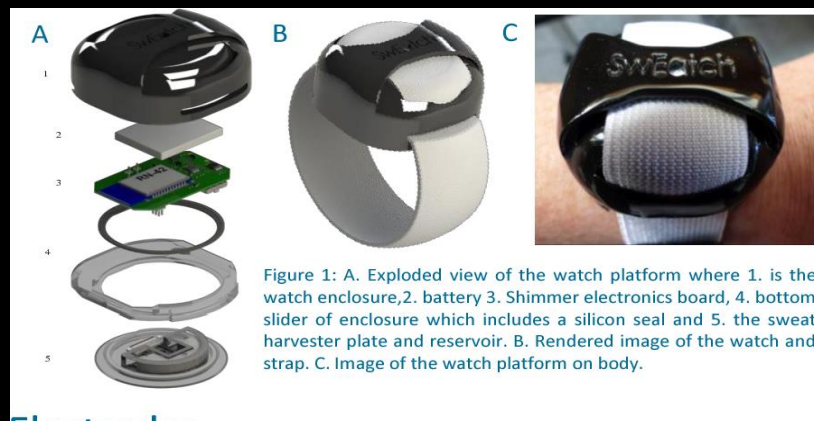
can help these sick people remember some of those things. It gives them better mental agility that can ease their process.

Assessing Skin Physiology



Another microcosm of a smart city is the creation of smart tattoos and samplers. This technology is designed for people with Chronic Skin diseases such as psoriasis, eczema, contact dermatitis, etc...These diseases an disrupt the skin barrier causing microbes to penetrate the barrier. Volatile gases can be sensed with smart tattoos or samplers

SWEATCH



The final microcosm of smart city I will talk about in this blog in a new piece of technology that has changed the game in terms of sport and health is the sweatch. It is a watch that monitors sodium and

analytes in sweat in real-time. It also monitors what exits your body. If we know what is coming out of your body, we know what should be put back in. This can be used for patients in hospital to help them recovery in favourable conditions. It can also be used for professional athletes. In a match situation this device can tell you what the player needs to give them maximum performance for the last few minutes.

For more on SWEATCH, visit : <http://doras.dcu.ie/21115/>

Data Analytics and our Cultural Heritage



In Ireland we are proud to have and still play our native sports such as Hurling and Gaelic. In order to keep the level of interest high, Insight teamed up with GAA to find out why people play these games. They found out that the reason people play GAA is because they want to be like their national and local heroes. All these people want to play like and with their heroes. The team asked what could be done with this information to get people to continue playing? They decided on creating a simulation game that allows players to play against their heroes. Another mode puts you into the game and gets you to repeat moves done by your heroes which inevitably helps you

improves your skills. This game can be used in actual training when training with the team isn't possible for example, rainy days.



In a study ran by the World Health Organisation (WHO) they predicted that “Ireland to be the most obese nation in Europe by 2030”. National Physical Activity Guidelines for children states that every child should be involved in at least 60 minutes of physical activity every day This information is shocking as Ireland is such a small country relative the others in Europe. In the CSPPA study, children who met the physical activity guidelines, had significantly healthier heart fitness, weight status and blood pressure than those who didn't. 17% of primary children met the National Physical Activity Guidelines. 10% of post-primary children met the National Physical Activity Guidelines.

SPORT EIREANN teamed up with Sport Northern Ireland and GAA Dublin to find out the cause of obesity in Ireland. They went to 44 different schools across 12 counties and assessed over 2000 student between the ages of 4 -13. They measured things like, muscular strength, height, weight, BMI, Cardiovascular Endurance and many more

Innovation 2020 - Clinical Research

Willie Muehlhausen

In this blog I will briefly discuss the correlation between Clinical Research and Innovation in the pharmaceutical and Health industry.

Clinical Research

According to Muehlhausen, a Clinical Research organisation is a company that provides services and technology to pharmaceutical, biotech and medical device companies to conduct clinical research.

These Organisations test drugs in people with different issues to see if they work. These issues can vary between a cold or flu to the more current, Coronavirus (COVID-19).

For more information on Coronavirus, visit:

➤ https://www2.hse.ie/coronavirus/?gclid=CjwKCAjw3bzBRBhEiwAgnnLCrXlxTsOFoBfx7LSIrf4yTZudFMxFWorxLq20NK4hRQxjy%20UmcX4CHhoCAKUQAvD_BwE



Applied Innovation

Famous Ice Hockey Player Wayne Gretsky once said, "I skate to where the puck is going to be, not where it has been". This simple quote says we should be ahead of the game. As innovators we need to make predications. Without a doubt, there is huge risk and ambiguity involved but innovation is all about talking risks and doing opposite to "The Norm".

Wayne Gretsky also famously quoted, "You miss 100% of the shots you don't take". As stated already although there is huge risk involved, we sometimes must just shoot our shot. We must try things. Yes. we could fail, but we must learn from that failure.



Clinical Trial Direction: Vision of the future

According to the World Health Organization (WHO) Clinical trials are a type of research that studies new tests and treatments and evaluates their effects on human health outcomes.

Clinical Trials are administered after new drug or vaccine is developed. Clinical trials are done to animals, just to ensure the drug or vaccine is safe for humans. After animal testing the drugs and vaccines are tested in humans. There are 4 phases to clinical trials.

For more information of the stages of clinical trials visit:

➤ https://www.who.int/health-topics/clinical-trials/#tab=tab_1

With the ongoing Pandemic of Coronavirus, these clinical trials will soon be administered. Predications suggest some time in the next few months. Hopefully they can be accelerated to an earlier time.



Governor Tom Wolf / CC BY 2.0

In the process of clinical trials test-subjects (patients) must travel to hospitals or medical clinics for tests. Nowadays some of these tests can be administered from the comfort of the patient's home.

These is done via:

- *eConsent and training*
- *Patient Reported Outcomes*
- *Wearables*
- *Sensors*
- *Remote Assessments*
- *Direct to patient medication shipping*
- *At home assessments*
- *In-pharmacy assessments*

Direct to Patient Projects

Sensor technology allows wearables to collect health and wellness data.

Data collection for outcomes research can be reported with minimal invasiveness. This just means patients can be passively monitored. All they must do is just live their life and their health and wellness can be observed.

One challenge to all this is patient privacy. Patient privacy is more paramount now. With the new GDPR Data Privacy Regulations we must make sure we don't infringe on their privacy. Therefore, we must make sure we encrypt the data and store it away, so no unauthorised people have access to it. If the data got into the wrong hands it could be detrimental.

GDPR Data Privacy Regulations:

➤ https://www.ibm.com/security/privacy?p1=Search&p4=43700050370983606&p5=e&cm_m%20mc=Search_Google-_-IS_IS-_-WW_IUK-privacy%20gdpr_e&cm_mmca7=71700000061224207&cm_mmca8=kwd357095708617&cm_mmca9=CjwKCAjw3bzBRBhEiwAgnnLCoez6E6HZ7WRbqeN_Gy8BV4u0sJgDO3sNgXhuukz3JiwGhteFe1MxoC4jgQAvD_BwE&cm_mmca10=406771686916&cm_mmca11=e&gclid=Cjw%20KCAjw3-bzBRBhEiwAgnnLCoez6E6HZ7WRbqeN_Gy8BV4u0sJgDO3sNgXhuukz3JiwGhteFe1MxoC4jgQAvD_BwE

Using Actigraphy in Clinical Trials Today

Actigraphy can be used for people with diabetes or CNS, Respiratory or Cardiology

Actigraphy is used because it is more responsive

➤ You can ask your patient what symptoms they suffered during the week. Some could explain every detail to perfection but for most people it's hard to remember exactly what happened or what time it happened. Actigraphy devices tell you what is happening in real-time. It records the time the patient experiences their symptoms.

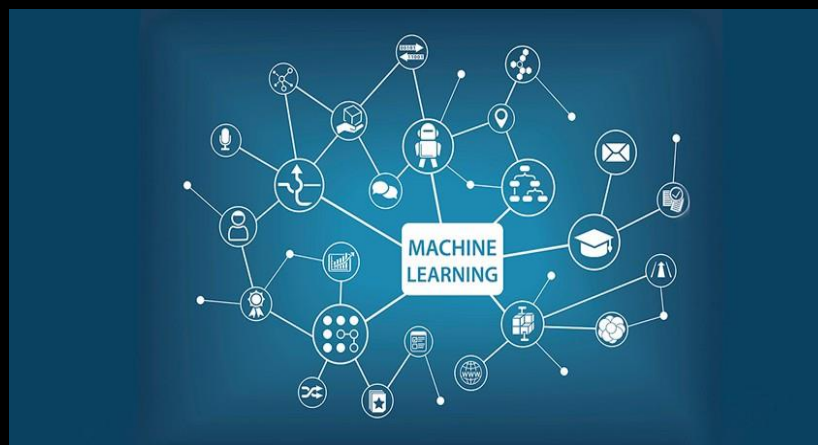
Influencing therapeutic intervention

➤ We can monitor how much work and movement a patient is doing. If a patient has just undergone surgery and they are moving around a lot, inevitably the pain will be more severe and will last longer. With actigraphy devices this can be monitored by doctors. They can tell the patient exactly why the pain has worsened or is taking longer.

Monitoring sleep

➤ Actigraphy devices can also help in monitoring patients when while they sleep. We can observe sleep patterns, restlessness, movement etc...

Fraudulent Behaviour



The idea of every patient cooperating and complying to the regulations is ideal, but it doesn't always happen. Some patients don't feel like they need to use these actigraphy devices. Some strap the devices onto their animals or give it to their kids or other relatives. Fortunately for the industry these actigraphy devices have been modified to recognise when the main user isn't using the device. For example, these devices can differentiate between the movement of the owner and that of a dog.

Summary

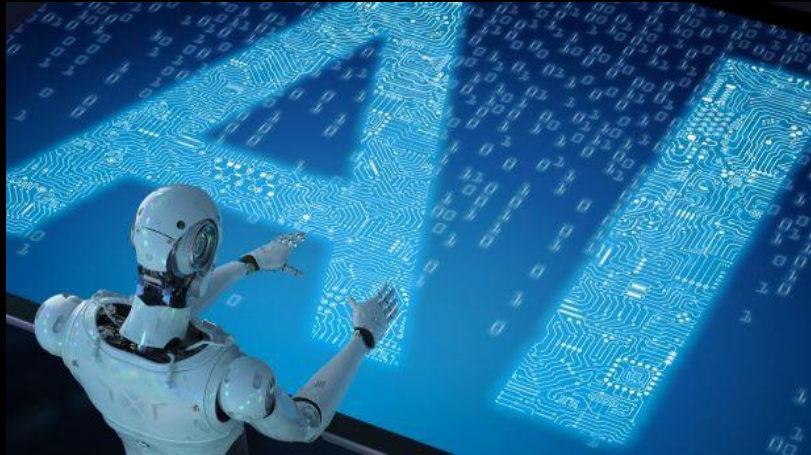
In summary, Innovation is very useful in Clinical Research. It makes the work of professionals and patients easier. Regardless of our situation we must keep innovating, keep changing the game. Without innovation we would Liquidate.

Artificial Intelligence

Tomas E Ward

In this blog I will discuss how Data and Artificial Intelligence (AI) create insight and cause innovation

Innovation



The aim of innovation with regards to artificial intelligence is to improve how we live, work, perform and how we make decisions. Development of artificial intelligence and machine learning can help us in the tracking of human health and fitness. Ultimately, we want these developments to be applied to the real world.

AI and Big Data are used to see patterns and learn relationships between our behaviour and physiology (how we move and interact with our environment) and enables us to gain a picture of how things are.

A lot of data used comes from wearables. These wearables come in the form of Implantables, Head-Mounted Displays (HMDs), Smart watches and even Smart Shirts.

A real-world example of these wearables is the Fitbit. This Smartwatch is designed to track important health and activity markers, including heart rate, quality of sleep and the number of steps walked.



AI and sensors

AI is now used when working with stroke patients. According to the Health, Safety and Environment Management (HSE), a stroke is a serious medical condition that occurs when the blood supply to part of the brain is cut off. After a stroke you can lose the ability to move your limbs, so u lose ability to move one of your hands. You want to move your hand but just you can't.



A brain Computer Interface was created where the patient thinks about moving their hand and the signals to the brain are measured and the damaged nerves are bypassed. A little haptic system that moves the persons hand is applied and as a result they can engage in rehabilitation.

Scientific Challenges

We can. scientifically demonstrate utility of wearable sensing & machine learning in tracking of:

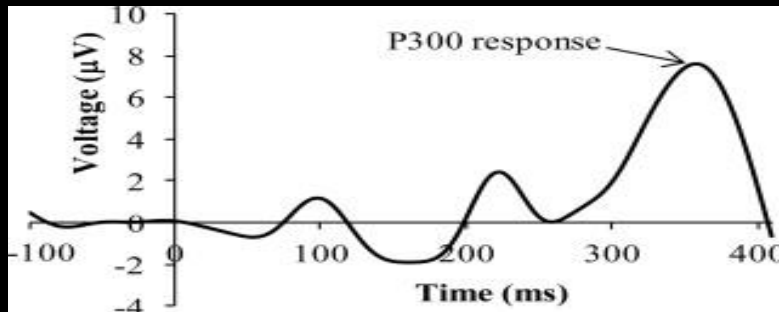
- *Cognitive function*
- *Everyday activities*
- *Neurological conditions*
- *Decision making*

Cognitive Function

The “P300” is a name for a specific brainwave that occurs in response to you spotting a target among a set of distracting stimuli. In trying to study this brainwave, an experiment was set up in which the subject is given a task. This task consisted of the subject being showed a series of pictures and is asked to find one a picture of a specific object. So, for example the subject is showed various pictures of bagels and is asked to find a doughnut. When the subject sees the picture of the doughnut,

subconsciously the P300 brainwave is activated. It is higher than all the other signals when the subject looks at the bagels.

This P300 brainwave is now used in improving and predicting human memory performance. With the use of AI and machine learning we can now train people to remember stuff better.



Everyday activities

With the Fitbit mentioned before, there are some problems when it comes to people using them when they aren't being physically observed. Some people with medical conditions are asked to wear these Fitbits so doctors can observe how patients move and interact at home. The problem with this is some patients tend to strap the Fitbit to their dog or even give it to a friend. This messes up the information on the patient and therefore lengthen their treatment.

Confusion Matrix is a performance measurement for machine learning classification. With the use of machine learning, computers can now decipher between different people's movement and day-to-day interaction.

Neurological Conditions

New-born babies can't tell you anything. You can't know if they are having a seizure as there is no set movement or pattern when this happens.

With the use of machine learning we can measure brain activity. Because brain waves change when you have a seizure, we can

now see when a baby is having a seizure and ensure the right procedures are implemented.

Conclusion

We have been using machine learning for improving health and human performance for some time

- *The newest ideas in AI have had transformative impact on what we do*
 - *Together with internet of things technology, data analytics and sensor science, it will continue to improve our lives*
 - *All other implications stem from human choice and intention*
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By Nicolas Oyeleye