

**Department of Information Technology**



# **BULLETIN OF INFORMATION TECHNOLOGY**

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**Department of IT**

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# **AT THE EDITING DESK**

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# **EDITORIAL**

## **Advantages Posed by AI in Cybersecurity**

**By Dr. Neeba EA | HoD**

With the advent of multiple devices and high-speed internet connectivity, improving cybersecurity requires more than just human intervention. Artificial intelligence (AI) and machine learning are technologies capable of analysing voluminous datasets swiftly, are able to discern a variety of cyber threats, and respond more effectively than conventional software-mediated methods. As threats continue to grow on a day by day basis, AI technologies continuously learn and improve so as to subvert future attacks.

Some of the advantages of AI in cybersecurity include, detection of new threats, ability to deal with bots, breach risk protection, and better endpoint protection. The main advantage provided by AI is its ability to detect possible malware or ransomware attacks prior to their entry into the system. Natural language processing allows for the curation of data on its own by analysing news, articles, and studies on cyber threats. This allows for more information to be gathered and for the development of new prevention strategies. Taking into consideration threats from cyber criminals, this poses as a hugely advantageous feature over traditional software systems, which cannot keep pace with the number of threats created every week. In addition, AI-based cybersecurity systems are also able to provide users with industry-specific dangers, which

takes into consideration the most likely threats to that niche.

A significant portion of internet traffic is taken over by bots. From time to time, they can be dangerous as their activities include, data fraud, fake account creation, and account takeover with stolen credentials. Typically, AI enables vast amounts of data to be studied in a relatively short time frame, allowing for the distinction between good bots that are useful to users and bad bots. This requires an understanding of behavioural patterns, which will enable this distinction.

Another innovative tool is in predicting how and when systems are likely to be compromised. AI systems can aid in determining asset inventories, i.e. record of all devices, applications, and users, and can help plan resource allocation to crucial areas. Such prescriptive input allows for enhanced protection from security breaches.

An increase in the number of devices that work remotely has been reported and with this comes a need to securing these endpoints. Traditional anti-virus software and VPNs offer resilience but they must keep upto date with signature definitions, which can become tedious. AI-driven endpoint protection provides a relatively proactive protection. Repeated training allows for the establishment of baseline behaviour and whenever anything out of the ordinary occurs, it will be flagged by the AI.

There are however some challenges presented by AI in cybersecurity. Maintenance of AI systems requires significant resources and financial investments. In addition, acquisition of data sets, comprising of malware codes, non-malicious codes, and anomalies is time-intensive but necessary for training AI systems. In the presence of voluminous data, erroneous results tend to occur, which can be detrimental to countering cyberattacks. While AI in cybersecurity aids in countering attacks, adversaries can utilise the same systems and can trigger machine models to misinterpret input. Therefore, most cybersecurity executives have opined that there is an urgent need to incorporate AI in cybersecurity defences, not only because it improves the accuracy and efficiency of response to cyber threats, but because cyber criminals are already utilising AI technologies to carry out attacks. Taking into consideration the vastness and increasing complexities of datasets, AI provides the necessary defence that humans may no longer be capable of providing on their own.

Growing threats to cybersecurity necessitates the use of AI, which can discover and prioritise risks, and identify threats, before they enter the system. This will enable organisations to possess a robust security architecture.

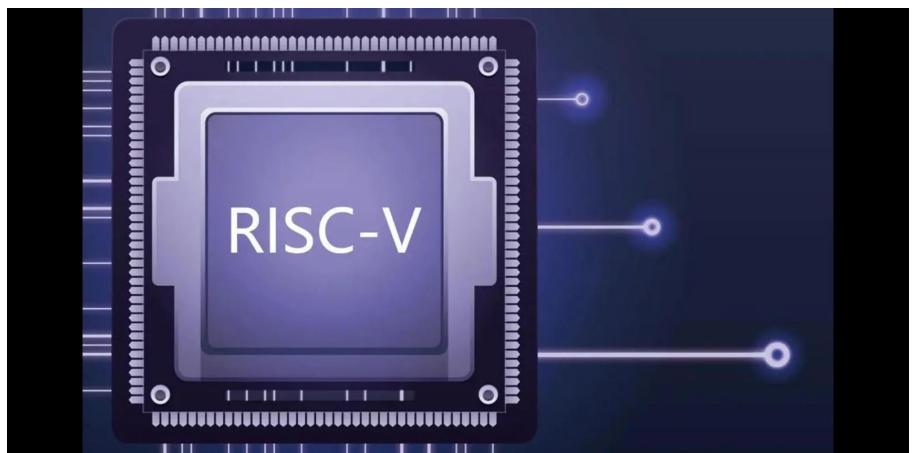
# **Apple's Break Up With Intel and What It Means for the Future of Personal Computing**

**By Arjun Sunil Kumar | S6-IT**

On June 22nd, 2020, Apple announced at the World Wide Developer Conference that they would be ending the use of Intel based processors in their Mac products which constitutes their desktops and laptops. To most people, this may seem like “What’s the big deal?”. To some others, it may seem like some publicity stunt by a greedy tech giant trying to use fancy words to demand more money for the same product. But what is Apple Silicon and why are the tech geeks either extremely excited or extremely disappointed? The first question in the minds of many is, what is Apple silicon? Apple Silicon is the name Apple has given to the ARM processors Apple has designed in house for their devices. In the 90s until 2005, Apple’s Macs were powered by PowerPC processors. PowerPC processors were designed under the Apple-IBM-Motorola alliance. From 2005, Apple has been using Intel processors to power their Macs due to their performance and efficiency.

Apple has been developing their own processors for the iPhones since iPhone 4. But all those processors were used exclusively in iOS devices. The A series of processors are all ARM processors, and now Macs are going to be running on those A series processors. What does it matter? ARM, x86-x64, they all do the same work, they all perform sufficiently but why is the switch of Macs from Intel’s x86-x64 platform to ARM making a lot of headlines? To understand this we need to look at the processor itself and how it works. Processors are the

computer's brain, they process data and give corresponding outputs. Fundamentally speaking, it's just a bunch of transistors and circuits arranged to perform a few simple tasks. All data that goes into a processor is in machine code(1010101001110, that kind of code), above machine code there exists assembly code. Assembly code is simple instructions which can be easily translated to the processor and can also be easily understood by a programmer. In the past it was necessary to know assembly language in order to make a software compatible with a particular processor. Depending on the processor it can understand anything from simple commands from add 2 numbers to commands like add 2 numbers, square it and find its cube root all in a single instruction. This meant sections of the processor were dedicated for each unique instruction that may or may not be needed. These kinds of processors were called Complex Instruction Set Computer(CISC),



A team at UC Berkeley came out with a different solution known as Reduced Instruction Set Computer(RISC). RISC featured highly efficient instructions that had the ability to perform tasks, much faster. The goal of RISC is to complete 1 instruction in 1 cycle. This helps keep the processor work continuously and helps ensure all parts are active. RISC had a huge drawback when it came to memory management compared to CISC, it just needed more space for most tasks.

Intel and AMD processors are based on the x86-x64 platform which is essentially a CISC system, which meant they have dedicated areas of the processor to simplify tasks but can't do all at once because it will get hung up on the slowest process. PowerPC on the other hand is a RISC system and was able to perform well. Everyone has heard of the ARM processor in their phones, ARM is Advanced RISC Machine.

All desktops and laptops have been using CISC chips for decades now and Apple has a radical decision to shift to their own ARM processors which are RISC machines. Apple's design is very efficient in terms of memory management as well since most iPhones come with under 4GB of RAM while the competitors are releasing 12GB and iPhones have been outperforming those phones in terms of memory and performance for years.

Microsoft experimented with ARM processors in their surface lineup but failed due to the lack of support from developers and which only snowballed with the poor

customer feedback as most amateur users were unhappy because the software that runs on the other laptops weren't running on this one.

Apple's move towards ARM chipsets for their Macs will bring in the ability for iOS apps and Mac apps to be cross compatible and also allow Macs to perform better and gain more battery life. It will however bring up issues related to support for Windows and Linux as these operating systems aren't entirely compatible with ARM. This could be the turning point in the PC industry that will push us towards a future powered by ARM processors

# **Machine Learning For A Safer Tomorrow**

**By Rosna Augustine | S6-IT**

According to wikipedia “Machine learning (ML) is the study of computer algorithms that can improve automatically through experience and by the use of data”. This article primarily focuses on how the essence of machine learning can contribute to build a safer country and protect people from various criminal activities they may encounter.

Machine learning, which is a part of data science, is divided into three types of algorithms, they are supervised, unsupervised and reinforcement learning. Supervised learning techniques can be used to build on the vast amount of data that exists in the crime domain. Classification algorithms which is a type of supervised learning can be used to predict criminal attributes. This type of technology helps the law enforcement officers to make more accurate and faster decisions to reach closer to the criminal because if they are set loose for a long time they can eradicate the evidences. Powerful algorithms such as Random Forest Classifier, KNN ,naive bayes ,etc can predict attributes of criminal like his gender, age ,race, etc by training the models using the piled up data available in the domain. The best algorithms can be chosen based on on various performance evaluation measures like precision, recall and F-measure.

The next type of algorithms machine learning have are unsupervised algorithms. They are algorithms that do not

train the models and are rather used to find interesting patterns in the data. One of the common use of unsupervised learning in the crime domain is to find hot spots i.e the areas where the criminal activities maybe high. Using popular clustering algorithms such k-means and fuzzy c-means crime patterns can be analysed and predicted. Using heat maps the results can be visualised as well. This will help the police to keep an eye out from areas with higher crime rates and will help people choose homes in areas where crime rate is low.

Machine learning is not only confined to serious crime analysis and detection but it is also used in less severe crimes like fraud detection, spam detection , vehicle theft detection etc. Fraud detection approach used classification algorithms to classify a particular transaction as fraudulent or not. If the transaction is classified as 0 it means that its not fraudulent and if it classified as 1 it means otherwise. Vehicle theft prediction is often achieved using grid based prediction using geographical features. Spam detection works similar to fraud detection.

Coming to reinforcement learning, it enables an agent to learn through the consequences of actions in a specific environment. A common application through which reinforcement learning contributes to a safer tomorrow is through traffic light control. Traffic control is necessary to avoid congestion. There are papers that achieve efficient traffic control using parallel learning techniques.

Due to these reasons Machine learning is going to gain more and more importance and the safety of every individual is the utmost priority in order to leave peacefully on the planet.Hence the demand for ML engineers is increasing day by day. ML finds applications not only the crime domain but also in domains such as healthcare, marketing, finance ,etc.

# **Quantum Computing**

**By Meenakshi Venkat | S4-IT**

Quantum computing is a rapidly-emerging technology that harnesses the laws of quantum mechanics to solve problems too complex for classical computers. Quantum computers are built for complexity.

## **Quantum**

The quantum in "quantum computing" refers to the quantum mechanics that the system uses to calculate outputs. In physics, a quantum is the smallest possible discrete unit of any physical property. It usually refers to properties of atomic or subatomic particles, such as electrons, neutrinos, and photons.

## **Qubit**

A qubit is the basic unit of information in quantum computing. Qubits play a similar role in quantum computing as bits play in classical computing, but they behave very differently. Classical bits are binary and can hold only a position of 0 or 1, but qubits can hold a superposition of all possible states.

Quantum algorithms take a new approach to these sorts of complex problems -- creating multidimensional spaces where the patterns linking individual data points emerge. Classical computers can not create these computational spaces, so they can not find these patterns. In the case of proteins, there are already early quantum algorithms that

can find folding patterns in entirely new, more efficient ways, without the laborious checking procedures of classical computers. As quantum hardware scales and these algorithms advance, they could tackle protein folding problems too complex for any supercomputer.

How does quantum computing work?

A quantum computer has three primary parts:

- ~An area that houses the qubits
- ~A method for transferring signals to the qubits
- ~A classical computer to run a program and send instructions

For some methods of qubit storage, the unit that houses the qubits is kept at a temperature just above absolute zero to maximise their coherence and reduce interference. Other types of qubit housing use a vacuum chamber to help minimise vibrations and stabilise the qubits.

Signals can be sent to the qubits using a variety of methods, including microwaves, laser, and voltage.

# **TECHNOLOGY IN SOCIETY**

## **Transforming Healthcare With 5G**

**By Ms Jean P Johny | Assistant Professor, DIT**

The much-awaited fifth-generation of cellular wireless technology has the ability to revolutionise healthcare with its high speed and massive connection power. Along with its many primary advantages, it will also empower medical innovations via extended reality (augmented/virtual/mixed reality), artificial intelligence, remote medical learning, patient care, and monitoring, to name a few. Moreover, India's healthcare industry has been growing at a Compound Annual Growth Rate of around 22% since 2016. At this rate, it is expected to reach USD 372 Billion in 2022. Healthcare has become one of the largest sectors of the Indian economy, in terms of both revenue and employment. The healthcare domain's critical and time-sensitive nature makes it all the more essential to have continuous access to near real-time data to support and derive full use of the advanced technologies today. The Government of India launched the Digital India campaign in 2015 in a bid to transform the country into a knowledge economy, with on-the-go access to information, governance and services. Since then, we have become the second-fastest adopter of digital services. With about

half a billion internet users, the potential to unlock an additional economic value of \$1 trillion dollars through inclusive growth is immense. This is also true of the healthcare sector wherein blending the digital approach can help tackle the issues of access, affordability and quality. Such a health system also fits in with the idea of an all-in-all digital nation supported by missions like the Ayushman Bharat and Make in India.

The applications of 5G in healthcare paint a promising picture of better and effective communications, efficient and quick transmission of large amounts of data for early diagnosis of life-threatening diseases, coupled with low latency and high computing power to enhance and accelerate the growth of diagnosis and therapy exponentially. Such applications of 5G technology would also be of great assistance when dealing with the unprecedented impact of the COVID-19 on healthcare systems worldwide.

Current networks cannot always meet consumer demands for data. During periods of heavy use, consumers may experience slow speeds, unstable connections, delays, or loss of service. The effects can range from annoyances like a life-threatening transmission delay between first responders in an emergency. With 5G network's 100x more capacity than 4G to connect with IoT devices, healthcare service providers can rely on remote patient monitoring or wearable devices to continuously collect, report, and transmit vital information to a remote monitoring centre.

The health care industry produces massive amounts of data. One patient can generate hundreds of gigabytes of data each day, from patient medical records to the large image files created by MRI, CAT or PET scans. According to AT&T, “Adding a high-speed 5G network to existing architectures can help quickly and reliably transport huge data files of medical imagery, which can improve both access to care and the quality of care. A 5G network means that these large files can be transmitted quickly between doctors and hospitals. It reduces the time that would otherwise be needed to move them across often under-powered legacy wired networks prone to cuts and other service interruption issues. The time reduction 5G brings means more timely diagnostics, second opinions, treatment starts and adjustments. Medical data can be transmitted and consumed by doctors faster than ever before, whether at home or in the office.

The switch to 5G also represents a long-term solution to the ever-rising need for bandwidth. Planned 5G data speed increases are more clearly keeping pace with improvements in diagnostic and medical imaging systems requirements than wired networks other than fiber-based. During the last 10 years, India has emerged as a significant economic power and our economic growth has been linked with the explosive growth of communications. 5G networks could transform—and improve—all of the critical components of healthcare, a subject especially meaningful today as the spread of the coronavirus has put unprecedented stress on healthcare systems around the world. 5G promises to provide essential levels of

connectivity to enable a new health ecosystem, one that can meet patient and provider needs accurately, efficiently, conveniently, cost-effectively and at substantial scale. As use of 5G in healthcare increases, with its applications boosted by advances in robotics, IoT and AI, a new connected healthcare ecosystem will take shape. In this view, the ecosystem will align with a relatively recent idea known as 4P medicine—that is, it will be predictive, preventative, personalised and participatory.

# **Data Science and Artificial Intelligence : Computer Vision**

**By Namita Ginu | S4-IT**

When we hear about data science or artificial intelligence , the thought of the vast ocean of knowledge and ability to create something more advanced, scares us ; but in reality, it's pretty simple. We observe, collect data, analyse and implement . Data science is basically using programming and algorithms to get all the loose and messy information available in this whole wide world and making it useful for us . And AI or artificial intelligence is implementing all of this to create machines that can more or less perform tasks that a normal human being can do .

Computer Vision or CV is a field of AI that makes it possible for machines or computers or systems to make sense of any visual data, like images or videos, and gets information from them and decodes them to their language and takes action based on the data gathered . The human eye is a complex design and just like how we interpret our surroundings , like the colours, depth, textures and human emotions , computer vision enables computers to see, observe and comprehend. Humans have a lifetime of data and context to process what we see , but machines ,although they're comparatively at a disadvantage, have to perform functions with data, algorithms and cameras. CVs , along with the help of neural nets , which are similar to the neurons in the brain , is all about deciphering and pattern recognition.

With computer vision our lives would be faster and easier and more effective if we implement them the right way. For example, 3D maps , drones, Google translations, thermal and infrared sensors , self driving vehicles like Tesla ,Audi and the like , use multiple cameras, sensors and radars which detects objects and traffic lights. Motion analyses and facial recognition is a very common usage of CV . It's also used in various industries like healthcare where its useful for CTs ,MRIs and Xray scans etc. Its used in manufacturing like reading barcodes, defect detection and constructions . Also seen in agricultural and military fields.

Computer Vision is becoming a daily necessity in our lives and as we all know the world is a big place and the data it contains a bigger mass ; we must find it within ourselves to explore the data and advance through it with the help of smart technology and further research, as by the time passes, computer systems and machines have more data, and more resources for computer vision to accurately perform their functions and pave way for more advanced AI systems like robots . CV is a very promising field in the future and should be treated with importance and what people say is the curse of our generation , the hoarding up of pictures and videos can be made into our boon, as it can make our lives easier and much more effective .

# **Bio Implants and Bionic Body Parts**

**By Sandra Mary Sunil | S4 IT**

## **Are bionic body parts or bio-implants a boon or a bane?**

Human body parts such as muscles, bones, and tendons are wired by our brain to be generally weak and conservative of our energy to reduce strain and maintain optimal body functions normally. This makes an average human less defensive in multiple situations like falling from a height, taking a blow etc, while people who train such as athletes and bodybuilders have a higher tendency to survive more physical constraints. The key point is that we can train ourselves to handle more physical stress.

## **What about those with a disability?**

For example, taking those with external physical disabilities like people who have lost their arms or legs in battles or accidents or cancer or even in cases of congenital amputation (those born without limbs) deserve a second chance. Hence bionic implants go a long way in helping them.

Bionic implants refer to electronic or mechatronic parts that augment or restore physical function to a differently-abled person. Bio-implants are defined as prostheses used to regularize physiological functions. They are made

up of biosynthetic materials like collagen, and tissue-engineered products like artificial skin or tissues.

## External Implants



The picture is that of Johnny Matheny who was a victim of cancer and had lost his arm in 2008. In 2015 he was the first person to attach a mind-controlled prosthetic limb directly to his skeleton. Even though it took him some time to adapt to it, he regained a complete range of motion with the arm.

The arm can be operated completely wireless via Bluetooth with the maximum precision of the nerves in the limb.

## **Internal bio-implants**

For patients suffering from bradycardia (slower heartbeat), a pacemaker implant is attached to the cardiovascular muscles in the heart to send electrical pulses to adjust the heart rate.

For people with auditory or visual impairments, certain bionic parts like cochlear implants for ears and argus retinal prosthesis for eyes are used to regain their sensory abilities. The bionic eye or visual neuroprosthesis are bioelectronic implants that restore functional vision to people suffering from partial or total blindness.

## **How does this tech work?**

So the question remains as to how these mechanical parts work with close to perfect precision? In a nutshell, scientists have built a particular kind of adapter plug that allows them to connect to living nerves on one end with electrically conductive filaments on the other. By using biohybrid bridges to link up the severed nerves in a human being, it makes it feel like a natural part of their body. The brain sends electrical signals when needed to move the arm. The muscles and nerves then send the signal to the electrodes present in the prosthetic arm and then the signals are turned into movements using a machine-learning algorithm.

## **Machine learning, AI and implants**

Machine learning works by exploring data and identifying patterns, similarly for each electric signal sent by the brain for different types of movement they are categorized into different data by the implants, which then read the data and perform the movements accordingly. Popular programming languages such as R, and Python are generally used here for precise data collection and to give out accurate outputs for steady movements.

## **Disadvantages**

Some of the general disadvantages of having bio-implants are-

- 1. Design and Metal-** They are generally hard to design since we use metal elements like grade 4 titanium to avoid easy rusting and withstand certain environmental limitations.
- 2. Proper research and development** are required to meet the neural level difference in each disabled person to make sure the cognitive response is accurate, that is the same implant won't work on different people.
- 3. Any interaction with a strong electromagnetic pulse (EMP)** will cause reverse induction of current in the chips which can cause the implants to not work or worse, malfunction.

**4. Limited charge** available for the implants as they use portable batteries. They need to be recharged periodically.

## Conclusion

With the advancement of AI and machine learning, technology keeps advancing to make machines more and more interactive with humans for their betterment. Hence computers play a huge role in the upcoming medical advancements. Advances in human bionics may eventually require us to rethink our concepts of what it is to be human, as the lines between human and machine become increasingly blurred.

Yet despite the desire to imagine a future of cybernetic enhancements, at present bionic limbs remain chiefly medical devices, designed to restore function and provide people who have lost limbs with a better quality of life.





# **ABOUT THE DEPARTMENT**

The Department of Information Technology came into existence in the year 2004 after bifurcation of Division of Computing Sciences. The B.Tech. (Information Technology) programme started in the year 2001 under Division of Computing Sciences. The M.Tech programme on Networking Engineering started in the year 2011. Our Programme had been affiliated to the Mahatma Gandhi University, Kottayam, Kerala from the 2001 to the 2014 admissions, and is affiliated to the A.P.J. Abdul Kalam Technological University, Trivandrum, Kerala from the 2015 admissions onwards. The Department imparts training in the area of Computer Networks, Network Security, Software engineering, Mobile Computing, database management systems, Information security, Web designing, Bioinformatics ,IoT, Data Mining, Big Data and many ICT related fields. One new programme was introduced under the department in the year 2020.

B.Tech. Artificial Intelligence and Data Science programme introduced in the year 2020 aims at developing the technical skills of students to perform data processing and analysis, which is an essential task in various real-world applications. During the last decade, data science engineering has emerged as one of the most lucrative career fields in technology and allied businesses. This programme aims at building not only the core technologies such as machine learning, deep learning, data modelling and data mining, but also gives intensive inputs in the evolution of technology.