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Editorial

We would like to wholeheartedly thank our honorable Chairman, Secretary, Executive Director and Principal for their continuous encouragement and constant support for bringing out the magazine. We profoundly thank our Head of the Department for encouraging and motivating us to lead the magazine a successful one right from the beginning. Ishare serves as a platform for updating and enhancing upcoming technologies in Information and Communication. We are grateful to all the contributors to this magazine so far. The magazine has been sent to almost 60 Institutions in and around Tamilnadu. So far we have received feedbacks and appreciations from various Institutions.

We would be very pleased to receive your feedbacks. Please send your feedbacks to ishare@ksrcas.edu

By,

Editorial Board

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1. UPCOMING TECHNOLOGY IN INDIA

1. Light Peak Technology

The Light Peak Technology will enable a super speed data transfer, which will be even greater than 100 GB per second. With this technology, we can copy a whole hard disk in just a few seconds. This technology is likely to emerge this year.

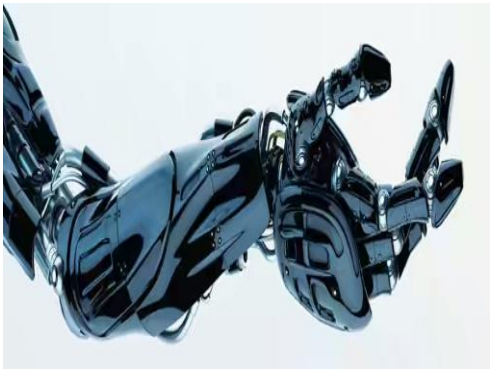
2. Talos "Iron Man Suit"

Talos resembles the Iron Man Suit in appearance. It's a combat suit for the military of U.S.

TALOS stands for Tactical Assault Light Operator Suit. This suit aims to offer better protection to soldiers.

3. Prosthetics

Prosthetics refers to an artificial body part, with a real sense of touch. The invention of prosthetics is made by European engineers and scientists. The artificial parts of the body are controllable, and prove to be a great help for amputees.



4. Aerofex Aero-X

Aerofex Aero-Xis similar to a hover board, which we can drive in the air, and it can run similar to a speed bike. This machine has been developed by engineers after long years of research. It lets one fly up to about 10 feet off the ground, at a speed of 45 miles per hour. This hovercraft which rides like

motorcycle makes quite an interesting technological marvel and we all would certainly look forward to its coming.

5. Self-Driving Vehicles

Although the making of self-driving vehicles started a number of years ago, however, in 2017 it's likely that we would see more numbers of self-driven cars and vehicles on the roads. Although companies like Tesla have made large strides in this field, this territory is highly dangerous, and with so many regulations in place, we need to see how technological companies go about in this field.

Many companies in this industry are gradually venturing into the market of self-driving vehicles and they have also achieved remarkable targets. The pioneering company in this technology is Elon Musk's Tesla. The company has been showing great potential, with the launch of its Autopilot feature

in the year 2015. Aiming to add more numbers of autonomous automobiles in the market, Elon Musk is trying to incorporate more self-driving hardware in his company's cars. Some other big names in the tech industry like Uber and Google are testing their autonomous vehicles, according to reports. In the meantime, even BMW and Apple are planning to venture into this market.

6. IOT and Smart Home Technology

"Internet of Things" – this term stepped into the technology world in the year 2016. The term refers to how our home appliances and other systems will become smarter, and the way they will become connected. In the past year, the problem that arose was that every big company concentrated on making devices a part of the entire system, rather than the entire group. This resulted in haphazardness when it comes to inter connectivity. However, now Apple, Amazon and Google have

begun working towards IoT full-fledgedly. It's likely that in 2017, the technology would be something we can look forward to. After the success of Amazon Echo, Google came up with Google Home. As both employ their virtual assistants, 'Assistant' and Alexa, it's quite likely for Apple and Samsung to venture in this field

2. UPCOMING TECHNOLOGY OUTER WORLD

We have seen great leaps in digital technology in past the past five years. Smartphones, cloud computing, multi-touch tablets, these are all innovations that revolutionized the way we live and work. However, believe it or not, we are just getting started. Technology will get even better. In the future, we could live like how people in science fiction movies did.

Today's post is about 10 upcoming, real-life products that are set to revolutionize the world as we know it. Get ready to control the desktop and slice Ninja fruits with your eyes. Get ready to print your own creative physical product. Get ready to dive into the virtual world, and interact with them. Come unfold the future with us.

1. **Google Glass**

Augmented Reality has already gotten into our life in the forms of simulated experiment and education app, but Google is taking it several steps higher with Google Glass. Theoretically, with Google Glass, you are able to view social media feeds, text, Google Maps, as well as navigate with GPS and take photos. You will also get the latest updates while you are on the ground.

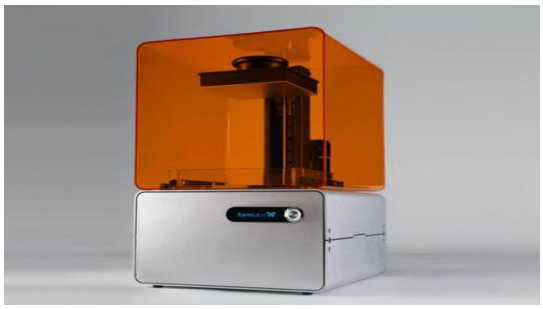
It's truly what we called vision, and it's absolutely possible given the fact that the Google's co-founder, Sergey Brin has demonstrated the glass with skydivers and creative. Currently the device is only available to some developers with the price tag of $1500, but expects other tech companies trying it out and building an affordable consumer version.

2. Form 1

Just as the term suggests, 3D printing is the technology that could forge your digital design into a solid real-life product. It's nothing new for the advanced mechanical industry, but a personal 3D printer is definitely a revolutionary idea.

Everybody can create their own physical product based on their custom design, and no approval needed from any giant manufacturer! Even the James Bond's Aston Martin which was crashed in the movie was a 3D printed product!

Form 1 is one such personal 3D printer which can be yours at just $2799. It may sound like a high price but to have the luxury of getting producing your own prototypes, that's a reasonable price.Imagine a future where every individual professional has the capability to mass produce their own creative physical products without limitation. This is the future where personal productivity and creativity are maximized.



3. **Oculus Rift**

Virtual Reality gaming is here in the form of Oculus Rift. This history-defining 3D headset lets you mentally feel that you are actually inside a video game. In the Rift's virtual world, you could turn your head around with ultra-low latency to view the world in high resolution display.

There are premium products in the market that can do the same, but Rift wants you to enjoy the experience at only $300, and the package even comes as a development kit. This is the beginning of the revolution for next-generation gaming.

The timing is perfect as the world is currently bombarded with the virtual reality topic that could also be attributed to Sword Art Online, the anime series featuring the characters playing games in an entirely virtual world. While we're getting there, it could take a few more years to reach that level of realism. Oculus Rift is our first step.

4. **Leap Motion**

Multi-touch desktop is a (miserably) failed product due to the fact that hands could get very tired with prolonged use, but Leap Motion wants to challenge this dark area again with a more advanced idea. It lets you control the desktop with fingers, but without touching the screen.

It's not your typical motion sensor, as Leap Motion allows you to scroll the web page, zoom in the map and photos, sign documents and even plays a first person shooter game with only hand and finger movements. The smooth reaction is the most crucial key point here. More importantly, you can own this future with just $70, a price of a premium PS3 game title!

If this device could completely work with Oculus Rift to simulate a real-time gaming experience, gaming is going to get a major make-over.

5. **Eye Tribe**

Eye tracking has been actively discussed by technology enthusiasts throughout these years, but it's really challenging to implement. But Eye Tribe actually did this. They successfully created the technology to allow you to control your tablet, play flight simulator, and even slice fruits in Fruit Ninja only with your eye movements.

It's basically taking the common eye-tracking technology and combining it with a front-facing camera plus some serious computer-vision algorithm, and voila, fruit slicing done with the eyes! A live demo was done in LeWeb this year and we may actually be able to see it in in action in mobile devices in 2013.

Currently the company is still seeking partnership to bring this sci-fi tech into the consumer market but you and I know that this product is simply too awesome to fail.

6. **SmartThings**

The current problem that most devices have is that they function as a standalone being, and it require effort for tech competitors to actually partner with each other and build products that can truly connect with each other. Smart Things is here to make your every device, digital or non-digital, connect together and benefit you.

With Smart Things you can get your smoke alarms, humidity, pressure and vibration sensors to detect changes in your house and alert you through your smartphone! Imagine the possibilities with this.

You could track who's been inside your house, turn on the lights while you're entering a room, shut windows and doors when you leave the house, all with the help of something that only costs $500! Feel like a tech lord in your castle with this marvel.

7. **Firefox OS**

iOS and Android are great, but they each have their own rules and policies that certainly inhibit the creative efforts of developers. Mozilla has since decided to build a new mobile operating system from scratch, one that will focus on true openness, freedom and user choice. It's Firefox OS.

Firefox OS is built on Gonk, Gecko and Gaia software layers – for the rest of us, it means it is built on open source, and it carries web technologies such as HTML5 and CSS3.

Developers can create and debut web apps without the blockade of requirements set by app stores, and users could even customize the OS based on their needs. Currently the OS has made its debut on Android-compatible phones, and the impression so far, is great.

You can use the OS to do essential tasks you do on iOS or Android: calling friends, browsing web, taking photos, playing games, they are all possible on Firefox OS, set to rock the smartphone market.

8. **Project Fiona**

Meet the first generation of the gaming tablet. Razer's Project Fiona is a serious gaming tablet built for hardcore gaming. Once it's out, it will be the frontier for the future tablets, as tech companies might want to build their own tablets, dedicated towards gaming, but for now Fiona is the only possible one that will debut in 2013.

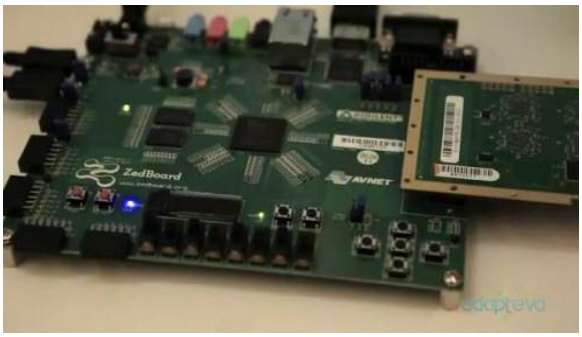
This beast features next generation Intel® Core i7 processor geared to render all your favorite PC games, all at the palm of your hands. Crowned as the best gaming accessories manufacturer, Razer clearly knows how to build user experience straight into the tablet, and that means 3-axis gyro,

magnetometer, accelerometer and full-screen user interface supporting multi-touch. My body and soul are ready.

9. **Parallella**

Parallella is going to change the way that computers are made, and Adapteva offers you chance to join in on this revolution. Simply put, it's a supercomputer for everyone. Basically, an energy-efficient computer built for processing complex software simultaneously and effectively. Real-time object tracking, holographic heads-up display, speech recognition will become even stronger and smarter with Parallella.

I never thought the future of computing could be kick-started with just $99, which is made possible using crowd funding platforms.



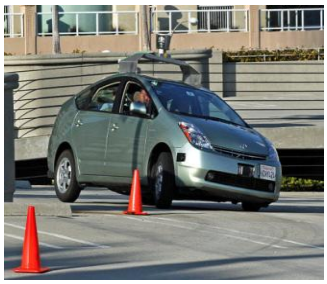
10. **Google Driverless Car**

I could still remember the day I watch the iRobot as a teen, and being skeptical about my brother's statement that one day, the driverless car will become reality. And it's now a reality, made possible by… a search engine company, Google.

While the data source is still a secret recipe, the Google driverless car is powered by artificial intelligence that utilizes the input from the video cameras inside the car, a sensor on the vehicle's top, and some radar and position sensors attached to different positions of the car. Sounds like a lot of effort to mimic the human intelligence in a car, but so far the system has successfully driven 1609 kilometers without human commands!

"You can count on one hand the number of years it will take before ordinary people can experience this." Google co-founder, Sergey Brin said. However, innovation is an

achievement; consumerization is the headache, as Google currently face the challenge to forge the system into an affordable gem that every worker with an average salary could benefit from.



3. ARTIFICIAL INTELLIGENCE COMPONENTS

1. Artificial intelligence(AI) will improve the customer service experience

Clearly, AI is one of the biggest tech trends right now, and anyone with solid tech startup ideas in the area of machine learning has the potential to go after big startup investment rounds, as well as to be acquired by the likes of Google, Salesforce or Apple, all of which have acquired more than 40 tech start-ups related to AI.

2.Machine learning becomes one of the strongestcybersecurity tools

Machine learning continues to be an essential tool in fighting increasingly complex hacking schemes. When it comes to fintech and the potential draining of billions from bank

accounts, AI will be even more important to combat increasingly complex attacks. Engineers must be careful to track how their systems behaviors respond to security threats, however, or risk missing out on uncovering exactly which vulnerabilities exist.

If there is one trend that is expected to dominate cloud vendor priorities in the upcoming year it is machine learning and artificial intelligence. All three of the major vendors made big announcements in 2016 related to this field. Google released TensorFlow, an open source machine-learning platform. Microsoft introduced a cloud-based platform for machine learning and Amazon announced three new machine learning services at is re:Invent conference. Expect the drumbeat of ML and AI news to continue into 2017, with this technology becoming easier for everyday developers to use and integrate into applications they're building atop these cloud platforms.

3.VR(Virtual Reality) technology will help businesses attract customers in a new way. AR (Augmented Reality)

Virtual Reality Probably will improve in hardware and the ways we interact with the virtual environments. Among the

trends affecting startup business there will definitely be AR and VR phenomena. Consider some of the other uses:

It's no accident that Facebook purchased production of the VR Oculus Rift headset. It is obviously anticipating that commercial media using the platform will be a 360-degree photo and video content.

Handicapped people may have access to VR in order to "travel" and engage with family members who are far away. VR will probably be used by business startups that have remote workers and have a need in them to be a "part of" the office environment. Thus, employees will be virtually in-house. Immersive technologies, such as virtual reality (VR) and augmented reality (AR), transform the way individuals interact with one another and with software systems. "The landscape of immersive consumer and business content and applications will evolve dramatically through 2021," said Mr. Cearley. "VR and AR capabilities will merge with the digital mesh to form a more seamless system of devices capable of orchestrating a flow of information that comes to the user as hyper personalized and relevant apps and services. Integration across multiple mobile,

wearable, Internet of Things (IoT) and sensor-rich environments will extend immersive applications beyond isolated and single-person experiences. AR & VR app development companies will be boomed more. Rooms and spaces will become active with things, and their connection through the mesh will appear and work in conjunction with immersive virtual worlds."

4. EXCITING UPCOMING TECHNOLOGIES

Here are some of the exciting upcoming technologies that will rule 2018 and beyond,

- **Chat Bots And Conversational Interfaces**

There will be more conversations with computers and technology that emerges to automate even more of our daily processes at work and in life. This is starting to be used now but is still not widely adopted. It will take more artificial intelligence to push this trend forward.

- **Electrovibration Technology**

Electrovibration technology will change the mobile touchscreen experience dramatically. You will be able to feel

different kinds of texture. I know what you are thinking. The online shopping experience will go notches higher. Imagine shopping for clothes online without worrying about the texture and quality of the cloth.

This advancement can also lead to socially beneficial trends. For instance, blind people can use it for Braille, and access smartphones like everybody else.

- **Speech-to-Speech Translation**

In 2012, Microsoft demonstrated impressive speech-to-speech translation and now, real-time multi-language conference calls may finally become a commercial reality in 2017. IBM has also mentioned that it will open its Watson supercomputing platform to third-party developers. This will allow natural language processing features to be built into apps.

- **Air to Fuel**

A British firm based on Teesside says it’s designed revolutionary new technology that can produce petrol using air

and water. The company believes the technique could help solve energy supply problems and curb global warming.

- **Bio Technology**

Bionic Hand controlled by brain signals. It does allow people without fingers to have fully functional hands that can pick up and handle delicate objects. It is completely controlled by the brain and requires no surgery. Touch Bionics, the company the produces the Pro Digits hand, is able to install the hand complete with "living skin," a plastic covering resembling human skin, for under $50,000. A small price to pay for a new hand I think.

- **Augmented Reality**

The future of mobile technology closely revolves around two words: "augmented reality" (AR). AR in simple terms means an advanced and unseen version of what we can see with our naked eyes. A regular sight when perceived through our smartphone infused with the AR technology will be enhanced through the use of computer-generated sensory input such as sound, video, graphics and GPS data.

- **Machine Learning**

What every startup wants to be is different each decade. In the 1980's it was a software company. In the 1990's it was an internet company. In the 2000's it was a social network. In the 2010's it's now a machine learning company. Even established businesses, eBay for instance, are reinventing themselves and want in on the machine learning "cognitive revolution."

- **Server less Architectures**

The rise of "function-as-a-service" platforms such as AWS Lambda or Azure Functions will bring the cost of DevOps to its bare minimum in the following years. Building your apps within such a framework helps to develop, deliver and scale services seamlessly for a fraction of the cost. The platforms are not there yet for massive adoption, but the trend is growing every day.

Even though we haven't quite hit the final quarter of 2017, you could say it's been an eventful year in digital transformation. Just as I predicted last year at this time, user experience (UX), big data, smart machines — and of course, change itself—have proven big players in the business landscape

this year. As we round the bend to 2018, we get a sense of what's ahead in the digital transformation—barring any unexpected disruptions, of course.

5th generation mobile networks or **5th generation wireless systems**, abbreviated **5G**, are the proposed next telecommunications standards beyond the current **4G/IMT-Advanced** standards, operating in the millimeter wavebands (28, 38, and 60 GHz).

5G planning aims at higher capacity than current 4G, allowing a higher density of mobile broadbandusers, and supporting device-to-device, more reliable, and massive machine communications. 5G research and development also aims at lower latency than 4G equipment and lower battery consumption, for better implementation of the Internet of things. There is currently no standard for 5G deployments.

The Next Generation Mobile Networks defines the following requirements that a 5G standard should fulfill:

- Data rates of tens of megabits per second for tens of thousands of users
- Data rates of 100 megabits per second for metropolitan areas
- 1 Gb per second simultaneously to many workers on the same office floor
- Several hundreds of thousands of simultaneous connections for wireless sensors
- Spectral efficiency significantly enhanced compared to 4G
- Coverage improved
- Signaling efficiency enhanced
- Latency reduced significantly compared to LTE.

In addition to providing simply faster speeds, they predict that 5G networks also will need to meet newuse cases, such as the Internet of Things (internet connected devices), as well as broadcast-like services and lifeline communication in times of natural disaster. Carriers, chipmakers, OEMS and OSATs, such as Advanced Semiconductor Engineering (ASE) and Amkor Technology, Inc., have been preparing for this next-generation (5G) wireless standard, as mobile systems and base stations will require new and faster application processors, basebands and RF devices.

Although updated standards that define capabilities beyond those defined in the current 4G standards are under consideration, those new

capabilities have been grouped under the current ITU-T 4G standards. The U.S.Federal Communications Commission (FCC) approved the spectrum for 5G, including the 28 GHz, 37 GHz and 39 GHz bands.

Debates:

Based on the above observations, some sources suggest that a new generation of 5G standards may be introduced in the early 2020s.However, significant debate continued, on what exactly was 5G. Prior to 2012, some industry representatives expressed skepticism toward 5G. 3GPP held a conference in September 2015 to plan development of the new standard.

New mobile generations are typically assigned new frequency bands and wider spectral bandwidth per frequency channel (1G up to 30 kHz, 2G up to 200 kHz, 3G up to 5 MHz, and 4G up to 20 MHz), but skeptics argue that there is little room for larger channel bandwidths and new frequency bands suitable for land-mobile radio. The higher frequencies would overlap with K-band transmissions of communication satellites.

If 5G appears and reflects these prognoses, then the major difference, from a user point of view, between 4G and 5G must be something other than faster speed (increased peak bit rate). For example, higher number of simultaneously connected devices, higher system

spectral efficiency (data volume per area unit), lower battery consumption, lower outage probability (better coverage), high bit rates in larger portions of the coverage area, lower latencies, higher number of supported devices, lower infrastructure deployment costs, higher versatility and scalability, or higher reliability of communication. Those are the objectives in several of the research papers and projects below.

GSMHistory.com has recorded three very distinct 5G network visions that had emerged by 2014:

- **A super-efficient mobile network** that delivers a better performing network for lower investment cost. It addresses the mobile network operators' pressing need to see the unit cost of data transport falling at roughly the same rate as the volume of data demand is rising. It would be a leap forward in efficiency based on the IET Demand Attentive Network (DAN) philosophy.
- **A super-fast mobile network** comprising the next generation of small cells densely clustered to give a contiguous coverage over at least urban areas and getting the world to the final frontier of true "wide-area mobility." It would require access to spectrum under 4 GHz perhaps via the world's first global implementation of Dynamic Spectrum Access.
- **A converged fiber-wireless network** that uses, for the first time for wireless Internet access, the millimeter wave bands (20 –

60 GHz) so as to allow very-wide-bandwidth radio channels able to support data-access speeds of up to 10 Gbit/s. The connection essentially comprises "short" wireless links on the end of local fiber optic cable. It would be more a "nomadic" service (like Wi-Fi) rather than a wide-area "mobile" service.

With 4G densification and 5G rollout that number might rise by 3x or more – and perhaps to over 100,000 base stations within 3-5 years.

Research:

The first widely cited proposals for the use of millimeter wave spectrum for cellular/mobile communications appeared in the IEEE Communications Magazine in June 2011 and in the August 2011 issue of the *Proceedings of the IEEE*. The first reports of radio channel measurements that validated the ability to use millimeter wave frequencies for urban mobile communication were published in April and May 2013 in the *IEEE Access Journal* and *IEEE Transactions on Antennas and Propagation*, respectively.

The *IEEE Journal on Selected Areas in Communications* published a special issue on 5G in June 2014, including, a comprehensive survey of 5G enabling technologies and solutions.*IEEE Spectrum* has a story about millimeter-wave wireless communications as a viable means to support 5G in its September 2014 issue.

- Radio propagation measurements and channel models for millimeter-wave wireless communication in both outdoor and indoor scenarios in the 28, 38, 60 and 72–73 GHz bands were published in 2014.
- First book on 5G mobile networks is published as "Software Defined Mobile Networks (SDMN): Beyond LTE Network Architecture" by the researchers in Oulu, Finland.
- Massive MIMO: This is a transmission point equipped with a very large number of antennas that simultaneously serve multiple users. With massive MIMO multiple messages for several terminals can be transmitted on the same time-frequency resource, maximizing beamforming gain while minimizing interference.
- Three Dimensional Beamforming (3DBF): utilizing hundreds of antennas at base station which performs in millimeter wave spectrum results in a highly directional antenna beam that can be steered to a desired direction which optimizes some performance metric of the network.
- Proactive content caching at the edge: While network densification (i.e., adding more cells) is one way to achieve higher capacity and coverage, it becomes evident that the cost of this operation might not be sustainable as the dense deployment of base stations also requires high-speed expensive backhauls. In this regard, assuming that the backhaul is capacity-limited, caching users' contents at the

edge of the network (namely at the base stations and user terminals) holds as a solution to offload the backhaul and reduce the access delays to the contents. In any case, caching contents at the edge aim to solve the problem of reducing the end-to-end delay, this is one of the requirements of 5G.

- Advanced interference and mobility management, achieved with the cooperation of different transmission points with overlapped coverage, and encompassing the option of a flexible use of resources for uplink and downlink transmission in each cell, the option of direct device-to-device transmission and advanced interference cancellation techniques.
- Efficient support of machine-type devices to enable the Internet of Things with potentially higher numbers of connected devices, as well as novel applications, such as mission-critical control or traffic safety, requiring reduced latency and enhanced reliability.
- Use of millimeter-wave frequencies (e.g. up to 90 GHz) for wireless backhaul and/or access.
- Pervasive networks providing Internet of things, wireless sensor networks and *ubiquitous computing*: The user can be connected simultaneously to several wireless access technologies and can move seamlessly between them. These access technologies can be 2.5G, 3G, 4G, or 5G mobile networks, Wi-Fi, WPAN, or any other

future access technology. In 5G, the concept may be further developed into multiple concurrent data-transfer paths.

- Wireless network virtualization: Virtualization will be extended to 5G mobile wireless networks. With wireless network virtualization, network infrastructure can be decoupled from the services that it provides, where differentiated services can coexist on the same infrastructure, maximizing its utilization. revenue by leasing the isolated virtualized networks to them and evaluating some new services.
- Cognitive radio technology, also known as smart radio. This allows different radio technologies to share the same spectrum efficiently by adaptively finding unused spectrum and adapting the transmission scheme to the requirements of the technologies currently sharing the spectrum.
- One unified global standard.
- *Real wireless world* with no more limitation with access and zone issues.
- *User centric* (or *cell phone developer initiated*) network concept instead of operator-initiated (as in 1G) or system developer initiated (as in 2G, 3G and 4G) standards
- *Worldwide wireless web* (WWWW), i.e. comprehensive wireless-based web applications that include full multimedia capability beyond 4G speeds.

- A highly reconfigurable system architecture for 5G cellular user equipment, namely distributed phased arrays based MIMO (DPA-MIMO) was published in July 2017 in the *IEEE Access Journal*.

Scope

FutureTech covers the following areas:

- Computer/Processor Evolution, Design and Manufacturing,
- Processor Announcement History and Performance Issues,
- Displays and Screens,
- Memory, Storage and Data Compression,
- Transmission and Communication,
- VR, Computer Graphics, Cyberware, Games, Video/Image Manipulation and Fakery,
- Lasers and Optical Devices,
- Artificial Intelligence,
- The Internet,
- Chaos Theory, Cosmology, Ethics, Military, Privacy, Extreme Technologies,
- Quantum Theory and Quantum Physics Research,
- Nanotechnology and Research,
- Superconducter Technology & Research,
- Buckyball Technology & Research,
- Miscellaneous

6. THE FUTURE OF CYBER SECURITY IN HEALTHCARE

Innovative technology is changing healthcare for the better.However, with the ever-evolving nature of technology and the new General Data Protection Regulations being enforced next year, cyber security has never been more important, especially for healthcare data.

The previous decade has witnessed a multitude of high-profile cyber-attacks,affecting aspects of both personal and corporate system and data.The most recent example of a large-scale cyber attack was the May 2017"**WannaCry"**ransomware attack which affected more than 200,000 computers across 150 countries.

To reinforce this,the introduction of the new General Data Protection Regulation(GDPR) in May 2018 will implement greater accountability for those that suffer a data breach due to inadequate consideration when protecting their data.

The implications are significant when it comes to healthcare,with more of the population employing Technology Enabled Care(TEC) to monitor their health.TEC has transformed health care over the past few years with the

growing use of remote monitoring,telecare and telehealth services.

Changing Nature of Healthcare Data:

Healthcare data is some of the most sensitive type of data as it is rich with personal information.Personal details previous healthcare issues,daily routines and location information can be accessed by the newest healthcare technology.

For Example,

Consider the implications of a service such as the Electronic Prescription Service(EPS)being tampered with,which in this instance allows prescriptions to be sent direct to pharmacies through IT systems.

Greater Connectivity Brings Increasing Challenges:

Increased connectivity resulting from improved infrastructure and the ever expanding '**Internet of Things'(IoT)**has meant that we are more vulnerable to remote attacks because our connected devices create more access point.Although it is challenging to completely mitigate against cyber-attacks,effort should be taken in the design stage of any healthcare technology to improve security.

For Examples,

Safeguards such as biometrics.

Improved Trust Through GDPR:

The new General Data Protection Regulation(GDPR)is being introduced in May 2018 to replace the longstanding Data Protection Act(1998).It increased the protection of personal data within the EU,and also its exportation outside of the EU.

Some of the changes GDPR will bring about include:

- ❖ Widening the scope of what is defined by ‘personal data’.
- ❖ Requiring explicit consent to collect personal data.
- ❖ Enforcing a “privacy by design” paradigm where systems must take security into account during the design phase.

If an organization does not comply with GDPR,they can be fined up to 20 m or 4% annual global turnover,depending which is higher.It is therefore imperative for organization of all size to adhere toGDPR.

The public perception is positive and builds trust as end-user are pleased to see legislation developed to better protect their personal

data.This is important to particularly healthcare,where a recent high-profile investigation by the information commissioner's office.

Future Innovation in Database Management:

Brute force attacks that use powerful computers create an opportunity for organization to establish innovative and impermeable new systems.Choosing algorithm that are the most difficult to hack is a good starting point,such as the AES256 which has revolution the computing industry over the past decade.

Uncertainity over future threats means sharing and applying understanding of what results in strong and robust system design is essential.An example of this is the 'block chain system'which is currently being employed by tech community allowing digital information to be distributed but not copied, with no centralized location for a hacker to corrupt.

7. MACHINE LEARNING

Machine learning (ML) equips computers to learn and interpret without being explicitly programmed to do so. Here, as the "computers", also referred as the "models", are exposed to sets of new data, they adapt independently and learn from earlier computations to interpret available data and identify hidden patterns. This involves data analysis and automation of analytical model-building using numerous ML algorithms. ML enables computers and computing machines to search

for and identify hidden insights, without being programmed for where to look for, when exposed to new data sets.

Evolution of Machine Learning

Today, machine learning is different from what it used to be in the past, due to the emergence of advanced computing technologies. Initially, it had gained momentum due to pattern recognition and the fact that computers did not have to be programed to execute certain tasks to learn. Many researchers who were interested in Artificial Intelligence (AI) investigated this area further to find out whether computers could really learn from data or not.

The focus here is on iterative learning. Machines begin to adapt to new data that they are exposed to, over a period. Based on the patterns and computations that are previously created, machines learn to repeat decisions made in the past, in similar situations. This aspect of machines' ability to learn from the existing patterns, is now gaining huge momentum.

Today, people are sitting up and taking notice of the fact that machines are now able to apply complicated mathematical calculations to areas, such as big data, at a much faster rate. Consider Google Car for instance, which is primarily built on the crux of machine learning. Another important use of machine learning can be found in regular recommendations that are rolled out by companies like Netflix and

Amazon - an example of machine learning in everyday life. Next, ML can also be combined with linguistic rules creation. This application is implemented by Twitter, where you will know what customers say about you. And not to forget, machine learning is significantly being used to detect fraud in various industry sectors.

What Should You Know About Machine Learning?

Gone are the days when programmers would tell a machine how to solve a problem at hand. We are in the era of machine learning where machines are left to solve problems, on their own, by identifying the patterns in each data set. Analyzing hidden trends and patterns makes it easy to predict future problems and prevent them from occurring.

A machine learning algorithm usually follows a certain type of data and then uses the patterns hidden in that data to answer more questions. For example showing a computer a series of photographs, some of which say that "this is a horse" and some of which say "this is not a horse." After this exercise, if you show some more photographs to the same computer, it will be on a mission to identify which of those photographs are of a horse and which of those are not that of a horse. Every correct and incorrect guess of the computer is added to its memory, which makes it smarter in the longer run and enriches its learning over a period.

How Does Machine Learning Work?

To get the maximum value from big data, businesses must know exactly how to pair the right algorithm with a particular tool or process and build machine learning models based on iterative learning processes. Some of the key machine learning algorithms are -

- Random forests
- Neural networks
- Discovery of sequence and associations
- Decision trees
- Mapping of nearest neighbor
- Supporting vector machines
- Boosting and bagging gradient
- Self organizing maps
- Multivariate adaptive regression
- SEO
- Analysis of principal components

As mentioned above, the secret to successfully harnessing the applications of ML lies in not just knowing the algorithms, but in pairing them accurately with the right tools and processes, which include -

- Data exploration followed by visualization of model results
- Overall data quality and management
- Easy model deployment to quickly get reliable and repeatable results

- Developing graphical user interface for creating process flows and building models
- Comparing various machine learning models and identifying the best
- Identify best performers through automated ensemble model evaluation
- Automated data-to-decision process

Why is Machine Learning So Important in Today's Business Scenario?

Most of the industries dealing with huge amounts of data have now recognized the value of machine learning. By gleaning hidden insights from this data, businesses can work more efficiently and can also gain a competitive edge. Besides, affordable and easy computational processing and cost-effective data storage options have made it feasible to develop models that quickly and accurately analyze huge chunks of complex data. Apart from enabling enterprises to identify trends and patters from diverse data sets, ML also enables businesses to automate analysis, which was traditionally done by humans. Using ML organizations can deliver personalized services and differentiated products that precisely cater to varying needs of the customers. Additionally, ML also helps companies to identify opportunities that can be profitable in the long run.

If you are planning to develop effective machine learning systems for augmenting your business, then here is what it takes -

- Superior data preparation capabilities
- Knowledge of basic and advanced algorithms
- Scalability
- Automation and iterative processes
- Knowledge of ensemble modeling

Applications of Machine Learning

The value of machine learning technology has been recognized by companies across several industries that deal with huge volumes of data. By leveraging insights obtained from this data, companies are able work in an efficient manner to control costs as well as get an edge over their competitors. This is how some sectors / domains are implementing machine learning.

- **Financial Services**

  Companies in the financial sector are able to identify key insights in financial data as well as prevent any occurrences of financial fraud, with the help of machine learning technology. The technology is also used to identify opportunities for investments and trade. Usage of cyber surveillance helps in identifying those individuals or institutions which are prone to financial risk, and take necessary actions in time to prevent fraud

- **Marketing and Sales**

Companies are using machine learning technology to analyze the purchase history of their customers and make personalized product recommendations for their next purchase. This ability to capture, analyze, and use customer data to provide a personalized shopping experience is the future of sales and marketing.

- **Government**

Government agencies like utilities and public safety have a specific need FOR Ml, as they have multiple data sources, which can be mined for identifying useful patterns and insights. For example sensor data can be analyzed to identify ways to minimize costs and increase efficiency. Furthermore, ML can also be used to minimize identity thefts and detect fraud.

- **Healthcare**

With the advent of wearable sensors and devices that use data to access health of a patient in real time, ML is becoming a fast-growing trend in healthcare. Sensors in wearable provide real-time patient information, such as overall health condition, heartbeat, blood pressure and other vital parameters. Doctors and medical experts can use this information to analyze the health condition of an individual, draw a pattern from the patient history, and predict the occurrence of any ailments in the future. The technology also empowers medical experts

to analyze data to identify trends that facilitate better diagnoses and treatment.

- **Transportation**

Based on the travel history and pattern of traveling across various routes, machine learning can help transportation companies predict potential problems that could arise on certain routes, and accordingly advise their customers to opt for a different route. Transportation firms and delivery organizations are increasingly using machine learning technology to carry out data analysis and data modeling to make informed decisions and help their customers make smart decisions when they travel.

- **Oil and Gas**

This is perhaps the industry that needs the application of machine learning the most. Right from analyzing underground minerals and finding new energy sources to streaming oil distribution, ML applications for this industry are vast and are still expanding.

Difference between Data Mining, Deep Learning and Machine Learning

While all of these methodologies have one single goal of deriving insights, patterns and trends to make more informed decisions, all of

them have different approaches to the same. Let's look at some of them below.

Data Mining

This process is a superset of numerous methods, which might involve machine learning and traditional statistical methods, to derive useful insights from the available data. It is primarily used to discover those patterns in a data set, which were not known previously. This approach includes machine learning, statistical algorithms, time series analysis, text analytics, and other domains of analytics. Besides, data mining also involves the study and practice of data manipulation and data storage.

Machine Learning

Like various statistical models available in the market, the main aim of machine learning is to determine and properly understand the structure and patterns hidden in data. Then, theoretical distributions are applied to data sets to gain a better understanding. Every statistical model is backed by mathematically proven theories. However, machine learning is hugely based on the ability of the computers to dig deeper into the available data to unleash a structure, even in the absence of a theory on what the data structure could look like.

Machine learning models are tested using a validation error on new data sets, contrary to going through a theoretical test that confirms a null

hypothesis. As machine learning is iterative in nature, in terms of learning from data, the learning process can be automated easily, and the data is analyzed until a clear pattern is identified.

Deep Learning

With the ability to combine computing power and unique neural networks to learn complex patterns in huge volumes of data, deep learning techniques are used to identify words within sounds, and objects within images. Several researchers intend to replicate this success achieved in recognizing patterns to address more complicated tasks like medical diagnosis, business problems, language translation, and other social problems.

Being a top innovative trend, machine learning is now being implemented by several businesses across the globe. With machine learning applications gaining prominence in most of the industries, are you all set to implement this technique in your business?

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Sophia speaking at the AI for GOOD Global Summit, International Telecommunication Union, Geneva in June 2017

Sophia is a social humanoid robot developed by Hong Kong-based company Hanson Robotics. Sophia was activated on April 19, 2015[1] and made her first public appearance at South by Southwest Festival (SXSW) in mid-March 2016 in Austin, Texas, United States.[2] She is able to display more than 62 facial expressions.