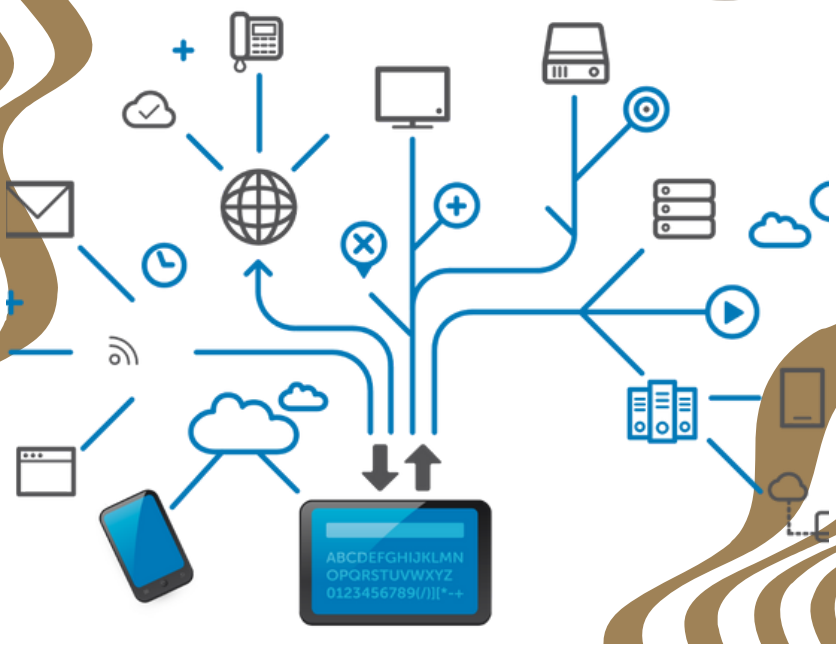
Hope Foundation's
International Institute of Information Technology, Pune

Gyanamrit

2019-20

Department of Electronics and Telecommunication



Department of Electronics and Telecommunication

VISION

To nurture young minds and provide them with a strong foundation through academic excellence & skill-based knowledge, transforming them into efficient professionals who can take on challenges in the fields of Electronics and Telecommunication Engineering for a sustainable technological development.

MISSION

- To educate students on domain knowledge in Electronics and Telecommunication Engineering using adaptive teaching-learning practices.
- To create a conducive learning environment that offers value-added education, enabling students to be career ready.
- To cultivate research & innovation as a bent of mind among students by industry-academia interaction.
- To enrich students with self-learning ability to sustain with technological changes.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

- Apply skills acquired in E&TC to analyze problems & design innovative solutions
- Inculcate the habit of self-learning using state-of-the-art technologies & innovations for continuous improvement.
- Internalize and display professional ethics, team spirit & respect societal values.
- Inspire students for higher studies & research.

PROGRAM SPECIFIC OUTCOMES (PSO)

- Understand fundamental concepts and acquire co-design skills of E&TC to apply them to its cognitive areas.
- Enhance programming skills for efficient coding practices using open source platforms.
- Develop analytical skills to achieve optimized and cost-effective technological solutions for challenges in E&TC.
- Bringing awareness about electromagnetic radiation hazards for the work environment

Editorial Committee

Student Members

- Nikita Mandal
- Pragati Kendre
- Mayank Pathak
- Mohnish Sancheti
- Ishan Modi
- Mrunalini Wale

Faculty Members

- Dr. Vaishali V. Patil
- Dr. Risil Chattrala
- Dr. S. M. Mahalakshmi Naidu
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- Prof. Ashok N. Shinde
- Prof. Anjali A. Jagtap
- Prof. Ashvini N. Kulkarni
- Prof. Ankita Agarwal

HOD's Message (Chief Editor)

GYANAMRIT, the departmental magazine, was founded with the primary goal of giving aspiring and aspiring engineers a broad platform to demonstrate their technical skills and to record their most original and brilliant ideas. They are able to advance their linguistic, semantic, and technological knowledge thanks to their contributions in the form of papers and articles. As a result, we are giving the readers fascinating and important information.

This edition aims to illustrate the "TRAITS OF THE NEXT GENERATION ENGINEER" by providing you with insights into recent advancements in electronics and telecommunication. Given the extreme effort and energy put in by the magazine committee and the faculty in charge, we really hope that all of the readers of the first edition of GYANAMRIT will be able to understand everything we have tried to convey.
The committee and the writers deserve praise for their great work. I appreciate your significant time and noteworthy efforts.

Prof. (Dr.) Risil Chhatrala

Faculty Incharge's message (Faculty Editor)

This issue of GYANAMRIT magazine aims to be informative, illuminating, commutative, and inspiring. We have made an effort to highlight subjects that have significant effects on current technology developments.

In this issue, we've taken the effort to educate you on the "Traits of the future generation Engineer."

I am confident that this issue will likewise be a huge success thanks to the fervent support and tireless work of everyone engaged in producing this magazine. I want to offer my sincere appreciation to the department's teaching members and the editorial staff for their tireless work. I also like to express my gratitude to the authors for contributing articles.

All the best to you.

Prof. (Dr.) Varsha Degaonkar

Editorial Head (student) message

We would like to start by expressing our sincere thanks to our principle, Dr. Vaishali Patil, and our department head, Dr. Risil Chattrala, for their motivation and inspiration in producing this edition of GYANAMRIT.

Along with the usual technical insights, we have attempted to gather the most accurate information on the state of the department and the system as a whole in this issue by posing questions to the five main stakeholders of the system: students, alumni, parents, faculty, and industry experts. We believe that this will not only help us function better but also reap more benefits from the existing system.

As a result, GYANAMRIT offers its readers a comprehensive package of the most recent technologies through the posters, some non-technical opinions and suggestions as articles, and a three-way perspective on different aspects of the learning phase of an engineer, all bundled into one as the "Traits of the Next Generation Engineer." This issue aims to inform engineers about the NEXT GENERATION ENGINEER TRAITS and how technology is being utilised to apply them, providing insights into those areas that are sometimes overlooked in the quest to acquire the skills required by expanding businesses.

In closing, we would like to extend our sincere gratitude to the faculty member in charge of this issue, Dr. Varsha Degaonkar, for her unflappable support and inspiration, as well as to our team for their enthusiastic and motivated approach to their work and for ensuring that GYANAMRIT upholds its standard by bringing in exceptional content. Without them, this problem would still be what we imagined it to be.

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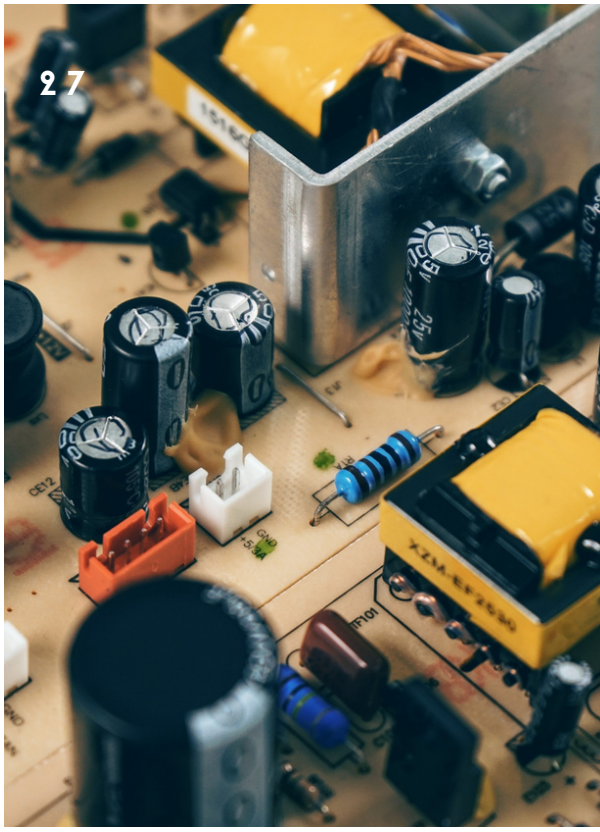
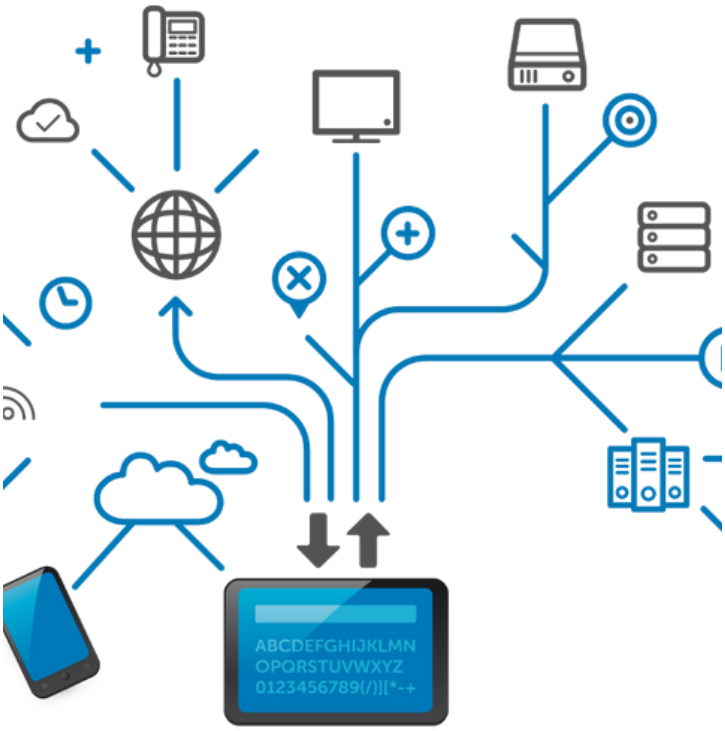


Gyanamrit



Learning

Prof. (Dr.) Risil Chhatrala

When I ask anybody what his/her understanding of the term “learning” is, I get so many different answers. Some say, getting new things, information, knowledge, skills, experience, view, behaviour, opinion, perspective or visualization and many more. Wikipedia, terms learning as the process of acquiring new, or modifying existing, knowledge, behaviours, skills, values, or preferences.

As an intellectual being, we are continuously evolving ourselves using one tool – LEARNING! In fact, I call it as learning. It can be acquisition of new set of information, interpretation of new perspective or application of existing theory or knowledge in an altogether new perspective/ scenario. As humans, we use this method to improve our thinking, and I realized that our actions are born from our thoughts. Our thoughts are products of our values, and our values come from our own belief system.

Most people misinterpret learning as formal education – which is only subset of universal set learning. Formal education refers to the bare minimum set of information, skill sets and knowledge that are required to survive in this world. However, that is not sufficient for developing human life.

The world is evolving day by day with new set of information, challenges, diversity and prospect for unexplored opportunities. Adaptive learning with positive mindset for dynamic situation where information, knowledge and challenges are rapidly changing is need of an hour. As a continuously evolving individual, it is need and responsibility of every individual to be lifelong learner.

When I did some deep thinking about how to improve my learning, I began asking those around me and every answer seems to right and a valid perspective of this complex phenomena called learning. One can always get new set of learning from one’s colleagues, friends, family and all members of society at large.

Interpretation given by a hawaldar, a vegetable vendor, a child or even a homeless person on the roadside can influence one's thought process. When one applies one's sixth sense, (I call it as common sense) with this new interpretation in one's work environment; the corporate honchos called it the "out-of-the-box" thinking.

Let me share a story. There was once an expert musician. Whenever he played violin, it rained; even in a desert. Once he went to watch a circus. In one of the performances, a bear was dancing to a tune played by the violinist from the circus. The musician approached him and said, 'You can make only a trained bear dance to your tune. But my music can make any animal dance! 'The circus' violinist rejected this claim as sheer nonsense. An argument ensued, resulting in a duel. The circus' artist called in a lion to face the musician. The lion, on hearing his music, began to gyrate in an ecstatic dance. Next, a cheetah was called and that animal too began to dance. The circus' artist sends in a tiger next. The musician continued to play nonchalantly. But the tiger was not enchanted by his music. On the contrary the tiger charged towards the musician. The audience scattered in terror. The musician threw his violin in the air and ran for his life. Luckily, he managed to escape from the tiger. The trainers soon caught the tiger and locked it up in a cage. The exhausted musician now accepted his defeat; however, he was still astounded as to why his music failed to charm that particular tiger.

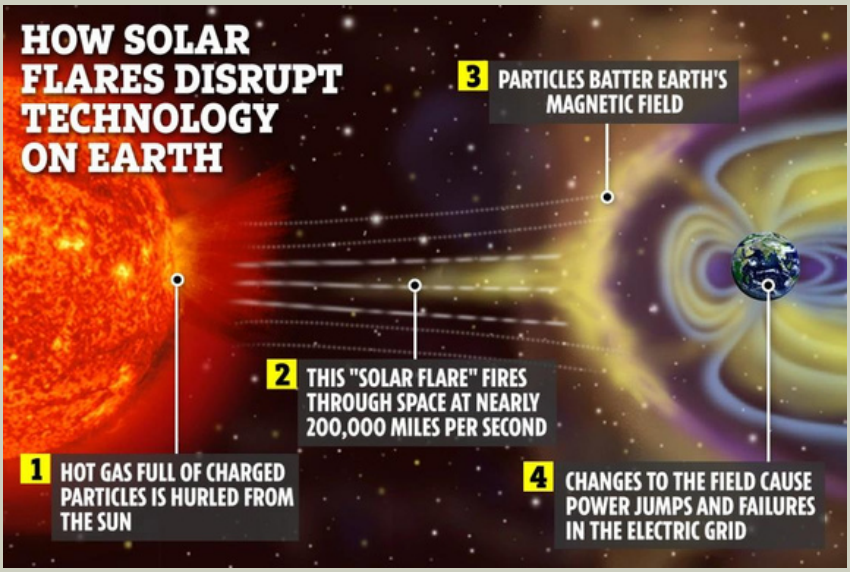
The circus artist explained with a smile, 'The reason is very simple. That tiger is tone deaf. It is a birth defect and this particular tiger does not have ears or even the apertures for hearing. The audience soon noticed this and tried to escape. But you were so involved in your playing that you failed to notice this simple fact!'

The awareness about present makes lot of difference in learning. When you are at receiving end and acquire required information related to things and environment around you, you can make relevant interpretation and live the smart life.

Learning is evolving process and always starts with acquisition of information, experience and degree of correctness of information sources. When acquisition of information is correct, judgment or interpretation can be correctly used to handle present set of challenges.

Space Weather & Solar Cycle

Dr V. Rajesh Chowdhary



Space weather which is governed by solar activities is the key cause of Sun-Earth interaction system. The Sun-Earth interaction significantly affects the magnetosphere-ionosphere-thermosphere system leading to diverse physical phenomena. The earth's ionosphere is highly affected with the space weather events such as Coronal mass ejections, geomagnetic storms, solar winds and solar flares. The earth's ionospheric parameters such as electron density, total electron content (TEC), electron and ion temperature behaves in a varied fashion to the incoming solar flux, electrodynamic drift, which makes its prediction very complicated. These parameters are found to be varying with local time, season, latitude, longitude, solar activity and with the conditions on sun and earth's magnetic field.

Recent increase in solar activities has resulted in an increased concern of the space weather community. These solar activities can lead to the major catastrophic events. It has been proven that every 11 years or so, the solar activities reaches to a peak; this phenomenon is referred to as solar cycle.And peak observed during these solar cycles is termed as 'Solar Maximum'. The solar maximum can extend to several years either side of the actual peak and the Earth gets subjected to by intense space weather. When these solar storms released due to severe solar activities are punched on to Earth, it may lead to various exceptional activities as well as major disasters leaving Earth out of electric power for years to come.

Solar Activities

Solar activities refer to any natural phenomenon happening on or in the Sun. These activities may be classified into:

- "Solar flares are abrupt bursts in the concentration of solar emission."
- "The solar wind is composed of particles charged with very high energy that are radiated from the sun."
- "A Coronal Mass Ejection (CME) is an immense explosion of solar wind into space."
- " Sunspots are momentary phenomenon on the photosphere of the Sun that appears as dark spots contrast to neighbouring regions."
- "Solar Cycle is a period of 11 years or so where the sunspot number reaches to the peak and solar activities increases."
- "Space Weather are the fluid environmental conditions of space, especially near- Earth Space or the space from the Sun's atmosphere to the Earth's atmosphere."
- "A Geomagnetic Storm is an impermanent commotion of the Earth's magnetosphere caused by the turbulence in space weather." (Information source: Helios, Goddard Space Flight Centre web link, NASA)

Solar Flares

An abrupt, rapid and severe variation in brightness is termed as a 'Flare'. When the magnetic energy which has built up in the solar surface is abruptly released, a solar flare takes place. Due to this sudden eruption, radiation is produced across almost the whole electromagnetic spectrum from long wavelength to short wavelength end. The quantity of energy erupted during the emission of solar flares is equivalent to millions of 100 megaton hydrogen bombs bombarding at the same instance. On 1st September 1859, first solar flare was recorded in astronomical records. And the scientists who viewed the large solar flare, separately experimenting were Richard C. Carrington and Richard Hodgson.

Due to this eruption of the magnetic energy, particles including heavy nuclei, protons and electrons are excited and accelerated in the solar environment. The amount of energy observed during mission of a flare is generally on the order of 10^27 ergs/sec.

And large flares can release energy up to 1032 ergs/sec. This energy released is 10 million times greater than the energy evolved from a volcanic eruption.

And on the counterpart, it is less than 1/10th of total amount of energy emitted by the Sun per second.

A solar flare consists of typically three stages. First is the precursor stage, where magnetic energy release is triggered. Soft X-ray emission is observed during this stage. In the second or impulsive stage, electrons and protons are accelerated to energies beyond 1 MeV. During this stage, radio waves, gamma rays and hard X-rays are released. The steady build up and perish of soft X-rays can be observed in the final stage named as decay stage. The existences of these stages can be as tiny as a few seconds or as extensive as an hour.

The frequency of occurrence of these solar flares coincides with the solar cycle of 11 years. During solar minimum, dynamic regions are small and rare, thus the minority solar flares are identified. As the sun reaches its solar maximum, an increase in rate of eruption of solar flares is observed due to increase in the number of active regions on the solar atmosphere. This time sun will reach its peak early 2014. (Information source: flares, Goddard Space Flight Centre web link, NASA)

How does artificial intelligence improve mapmaking?

Pierluigi Casale

How many roads lead to Rome? The ancient parable says all of them, although this is not quite correct. Our estimates say there are a hundred quadrillion routes (that's a figure with 26 zeros) that could make that journey, and that is just in Europe alone.

We've been busy driving and mapping the roads for many years. Our maps move the world forward every day. They cover over 68 million kilometers of navigable roads in 164 countries and 35 territories.

More than three million kilometers are driven by mobile mapping vans each year. Each of those vehicles has the capability to capture images at 5 million pixels per km at a speed of 700,000 data points per second, to an accuracy of 2cm per km.

Vehicles cannot rely on sensors alone; they need accurate images of the road to improve safety. We use these images, along with lidar systems to help autonomous vehicles to get around unaided.

The images we take are shot at one particular point in time, with one particular type of weather. Of course, we can't repeat the same process for when it is raining, or dark, or foggy, or for any other weather pattern that Mother Nature may throw at us.

We can't possibly remap the terrain to demonstrate all these parameters. For that reason, we're increasingly turning to artificial intelligence (AI) to recreate those conditions for us. Artificial intelligence is key factor for autonomous vehicle development.

Lidar is a laser that is constantly measuring its surroundings by the time taken for a light beam to return to the sensor. In that way it can build up a model of streets and obstructions that along a pre-mapped route.

When obstructions get in the way, such as another vehicle, or bad weather obscures the view, then AI needs to take over to anticipate what could be around the corner or how the road is going to behave.

Vehicles cannot rely on sensors alone; they need accurate images of the road to improve safety. We use these images, along with lidar systems to help autonomous vehicles to get around unaided.

Pierluigi Casale
Group Data Scientist, TomTom

Using generative adversarial networks to make better maps

To do this, we literally set one AI system up against the other to create images that are real or fake. It's a grand game of Call My Bluff, where the AI system has to decide whether the image is genuine. By playing and replaying the process, the algorithm rapidly improves until it can automatically create believable images that were never actually photographed in the first place.

These systems are known as generative adversarial networks (GAN). At TomTom, we started using this technique to create all-weather imagery of all the roads, so we know how to turn sun into showers and day into night. We are creating all weather images for 400,000 km of roads across the world.

But while AI provides an elegant solution to the enormous challenges of mapping the world's roads in every conceivable condition, we still need to keep the actual images of the road and the physical environment up to date.

Nowadays, devices also have to take into account real-time information about the traffic situation, weather or detours. Modern navigation systems can constantly readjust the route if the traffic situation changes or a traffic jam blocks a major road. Machine learning techniques can anticipate what a traffic jam can do to anticipated journey times, for example.

For future generations of vehicles, navigation will become even more complex. Guidance systems will have to take into account whether the battery charge on an electric vehicle is sufficient to reach the intended destination.

Learning algorithms can also adapt to a driver's style behind the wheel and get better at understanding it with every journey. A more aggressive style of driving can shorten the range of a journey by up to a third, for example.

Of course, this needs a huge amount of computing power, but we are partnering with Microsoft and utilising the cloud to ensure we capture large amounts of data that can be used in real-time driving conditions.

The wisdom of crowds in creating high-quality maps

It's almost impossible to map every square inch of the globe manually. Besides, as soon as it is done, then it needs to be redone. Nothing stands still. Road layouts change, new buildings are erected and even the topography can change.

For that reason, we turn to crowdsourcing to ask the general population to keep us updated on any changes. People can use our TomTom apps to send pictures of where reality doesn't match what we have recorded on our maps, alerting us to send someone out to check and accurately record it.

This is much more effective than ad-funded maps. How can we trust these service providers will always send us the quickest route or if they'll send us on a detour past one of their advertiser's drive-thru restaurants?

Paid-for, ad-free mapping providers have the advantage of trust. People know that if they take images of the road and send them to a company that doesn't advertise, they will be actively taking part in a community that helps everyone – much like Wikipedia.

But we don't just rely on the community – the team at TomTom also crawl the web on a daily basis to find announcements about changes to the road infrastructure, new building developments etc. It's the key to how we detect changes and improve maps by using multiple trusted sources.

Keeping data secure

Because of the amount of data we handle, we also have to be very aware of security issues too. One of the biggest challenges with AI is keeping data secure.
We ensure we can anonymize data, so individuals can't be identified on their location or journeys. It helps prevent knowing when somebody is away from their premises, for example.
AI algorithms can still learn from anonymized data. Once trained, the models can be shared and we can continue to train and enhance the full pool of shared models with new ones. It means the continuous virtual circle of uninterrupted learning continue.
It helps to secure our vision for a safe, connected, autonomous world, free of congestion and emissions. Our mission is to create the most powerful technologies to help shape and solve tomorrow's mobility issues – and AI is a powerful tool to help us along that path.

The ultimate aim is to provide the data and information needed for Level 5 autonomous vehicles – those that can drive and operate independently of a human driver. The more information we can gather, collect and utilize, then the closer we will get to achieving that goal and witness a truly autonomous future for vehicles.

We ensure we can anonymize data completely, so individuals can't be identified on their location or journeys.

Pierluigi Casale
Group Data Scientist, TomTom

Reinventing Myself

Mr. Saugato Banerjee

Benjamin Franklin (1706 – 1790) once said, “People die at the age of 25 but are not buried till they are 75”.
I could relate to that because I see this amongst most of us. We just have decided to exist. Same us, year after year. But, and that is a very important but, we still end up wanting more.
We do not change but we want change for the better for us. More money, more control, more power, faster promotions, more love and lastly more happiness…
Unfortunately, our incoming will always be directly proportional to our outgoing. We will receive only as per how much we give. If our giving remains constant, our receipts will also be constant. Nothing will change.
Personally, I have always been about challenging myself and for those who know me, they’ll agree, by my life, career or occupation choices I have made so far.
But what if I am at a place right now where changing my job or occupation and to look for a newer fresher challenge is not an option? What do I do? Where do I get my new challenge (kick) from? Do I now accept life as it is and stagnate? Do I just say to myself, “this is it bro, end of the line for you”? Am I then just to be a ‘dead man walking’?

NO. Nada. Nyet! Plain unacceptable.

Just as simple as that.
So, what do I do now?
I reinvent myself.
Easier said than done, right? But believe me when I say this, it takes a hell of a lot of doing.
I started to ask myself that all this thought of reinventing myself is fine but how the hell am I supposed to do it?
What is this reinventing all about?
Do I even really need to go through this process?
Why?
What’s wrong with life the way it is?
Sab kuch toh hai mere paas, zaroor thoda kam hai, aur hota toh achha hota par isise chala lenge na yaar… what’s all this bullshit about challenging myself, kick chahiye etc. etc
But then, what old Ben said about 250 years back came back to haunt me. I realized I owe it to the evolution of mankind over a million years, to be at the top of the food chain, the only intelligent beings on this planet, to not let “average” take over me. I did not want me saying these words, ‘same shit, different day’ to any one who’d ask, “how’s life bro?”

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I needed to live, feel alive through the work I do and not merely exist a 9 – 5 existence.
I owe it to myself to change.
Now that I had made up my mind, I needed to start the process from somewhere and I started thinking. I deep dived into that thought. Not surprisingly, I came across a very common pattern, past or present.
Leave alone reinventing, no one even wants to "change".
We all have heard that change is the only constant but how many of us have really internalized this age old adage? Very few, if at all…
Truth be told, we all fear change.
Since the time we are kids, we have always been told how things are supposed to be, how we are supposed to be, what to do, what not to do.
We would always be labelled as a fool or simply stupid should we think different or want to do different… till such time that we start believing all that has been told to us as gospel and leave our ability to think independently in a cryogenic chamber.
Never to be used again. Afraid of being the outlier.
Having said that, surprisingly enough, I have in my entire life never seen absolutely anyone, aim for Average!! All are aiming for Great!
But all of us also have a "B Plan". That's funny to me.
Because my understanding is, if you are aiming for Great, there is no settling for anything else, even Good.
Why even aim for Great? Why not aim for Perfection?
If we want something different to happen to us, if we want to bring about a change, if we want to chase our dreams, there is just no settling for anything but that.
In the limited time we have, we just have to go for it or perish trying.
Plain and Simple.
But we somehow lose it (our mojo) on the way. We become comfortable and begin to create "comfort zones" for us.
Though secretly, we desire more. Somewhere in our own inflated assessment of ourselves, we believe that life owes it to us, owes us better.
We do not realise that life owes us nothing that we haven't given to it.
We become victims of our own complacency and start blaming others for our shortcomings.
We begin our journey of Average.
Okay, all the above was the result of my deep dive in to the past and present and I started to identify certain factors that stop us from changing or reinventing ourselves.
Once we are able to overcome these factors or trade these "baggages" for other qualities lying within us, I firmly believe we will find reinventing ourselves very doable.
So, let me begin…
Firstly, to reinvent myself, I have to leave the older version of "me" behind.
How do I do that? Well, reinventing can be done 'outside in' or 'inside out'.
What do I mean by that?
'Outside in' would mean a new hairstyle, new clothes, new shoes and all such.
I immediately recalled that whenever I have done all this, I have felt better, more confident, happy.
But the flip side is, I would have to do this 'outside in' reinventing frequently as all these "feel goods" do not last for long. That's a problem then.

I switched my thinking to 'inside out'.
Needless to say, this is a much more potent way of reinventing oneself but is equally difficult.
So, I started by asking myself first, what is it that I want to reinvent? And how do I go about it because I want to turn over a new "ME".

That sounded crazy because I am what I am, a sum of all my years of learning, experiences, knowledge, things that I know etc. how do I erase all that and start building this new "ME"?
It was then that I realized, why it is so difficult to change, leave alone reinvent oneself. So difficult to leave the older version of "ME" behind.
Let me try and break down the "baggages" that stop us.
"I don't have money" baggage: All the time, while growing up till adult hood, we hear parents, people, friends, colleagues say they do not have money, or at least not enough of it any way.
We kind of form this as a truth in our lives that how much ever we have, it will never be enough and hence we cannot achieve our desires or wants. We are kind of taught that we'll have to make sacrifices because we do not have enough.
What we fail to realise is, we are not the victims of our resources, rather we are victims of our inability to tap into our ability to create more resources.
Question – How can we get more resourceful?
"I am very busy now" baggage: Again, we are brain washed into being busy. We start feeling guilty when we look around and see seemingly busy people while we are not.
Typically the same feeling when we finish answering the examination paper earlier than the others in the classroom. We start doubting ourselves and our ability.
Come to think of it, busyness does not equal progress.
Reality is, when we commit 100% to do something, we do find the time to do it.
"It's not my fault" baggage: Main kya karoon? Yeh meri galti nahin hai…
Main toh karna chaha raha hoon, par… Aaj Mausam theek nahin hai… Aaj mera colleague kaam pe nahin aaya…
It goes on and on. We blame everything and everybody for all our inefficiencies.
Why don't we trade blame with leadership? Why don't we start by asking,
What can I do now? What should I do now? What do I do now?
"I'll do it later" baggage: We simply delay, most of the time for no reason at all. As if procrastination has become second nature to us.
"Karta hoon thodi der mein…", "Pakka kal se…", "Karna toh mujhe hi padega, karta hoon na…" and the best of all, "2 minutes…"
The smarter among us have even designed a word to substitute procrastination. It's called "preparation". Some of us are perpetually "preparing". As if "preparation" will give us the end result.
We will have to trade off "preparation" with "action".
We have to change delay to "NOW".
"The Delusion" baggage: "I am working on it…", "Main ispe kaam kar raha hoon…", "I am working on losing weight…", "I am working on how to increase our bottom line…", "I am working on becoming a better human being…"

Actually, I am doing nothing. But somehow the above sentences are designed to make us feel good because we have created and want to live in this “delusion” that I am doing something about the issue at hand.

We have to be totally honest with ourselves and trade off this “delusion” with immediate action. It will also require a lot of introspection and integrity.

In the end, if we desire a changed or reinvented “ME”, we have to discard all our old baggages and trade them off with,

Resourcefulness

Commitment

Leadership

Now

Total Honesty with self and Immediate Action.

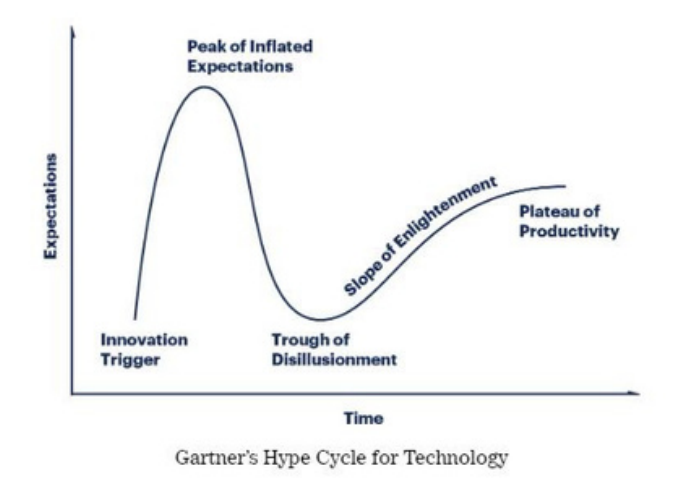
Voila! We have the new reinvented “ME”.

Fabrics of Reality

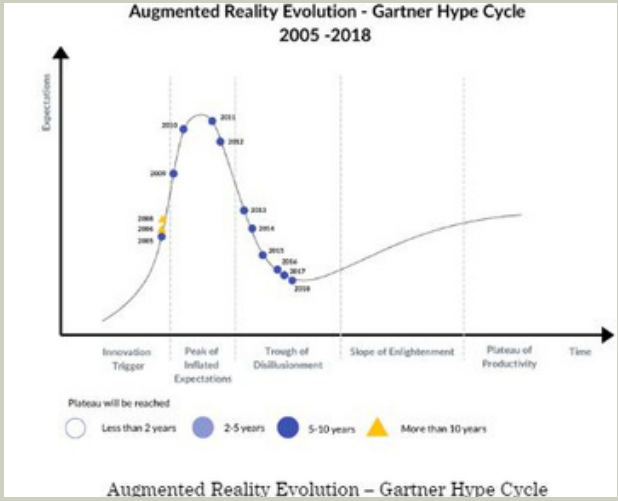
Sameer Mohanty

The phrase seems to be resonating with meta-physics or the space-time fabrics, however, we won't be tunneling our mind into these topics in this article. I am focusing on the technologies which are going to shape tomorrow's landscape. 27 years back, Internet was just a research project but now we can see the whole fabric of data roaming around from one device to another. Internet has become a daily need indeed.

Kindred to the same aspect, we can see a lot of technologies being implemented, discussed, conceptualized and adapted by homo sapiens. One of the technologies being adapted is Immersive Reality. It's a super-set of Virtual Reality, Augmented Reality, Mixed Reality. It's being developed, nurtured by many scientists, researchers and technocrats; it's being inculcated by many companies like Mercedes, Boeing, Airbus etc. But still I feel it's just a beginning of exploration. Five years down the line it will be adapted by 20% of the population in any format. Validation of any technology trend is done by comparing it with Gartner's Hype Curve.



Gartner's Hype Cycle for Technology

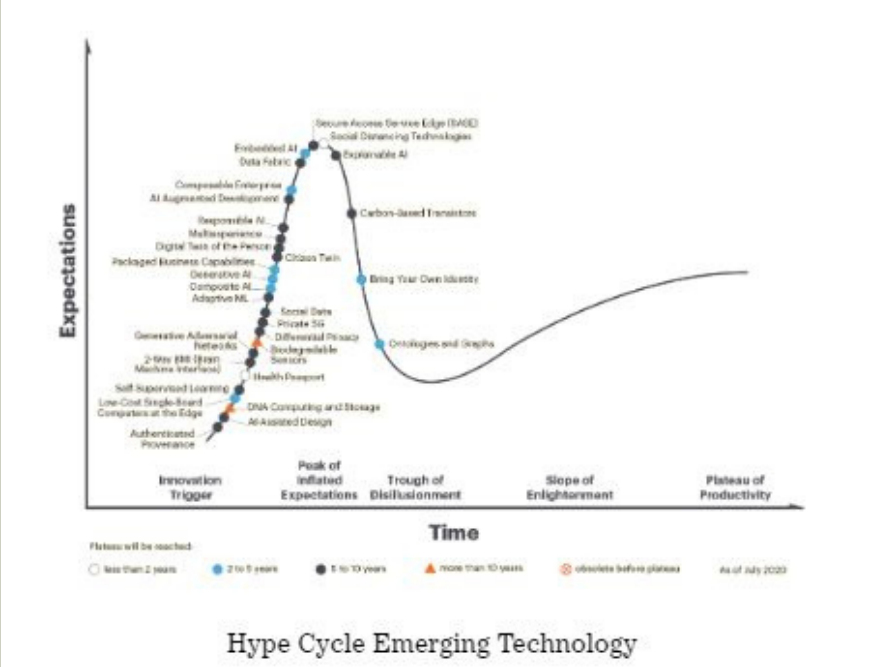


Augmented Reality Evolution – Gartner Hype Cycle

This gives us a fair idea about the scope of Augmented Reality in the technology spectrum. Think about the immersive fabric connecting each of us in collaborating, decision making, entertaining and educating us through simulation. After climbing up the curve steadily year by year in the cycle, Augmented Reality took a steep ride down to the trough of disillusionment in 2018. "Another 5-10 years" – that's the time specialists estimated AR would succeed to maturity.

Key learning from these early commercial deployments is the role of AR in complex business solutions: it thrives when used in combination with other technologies, rather than a stand-alone feature. AR acts as an indispensable component for highly tailored solutions that require a deeper integration between digital and real worlds within the enterprise.

Catalyzed by a global pandemic, Augmented Reality will become more ubiquitous and move to where it should be – blended with the world around us. That's what I call the "Fabrics of Reality"



Hype Cycle Emerging Technology

The above diagram gives an insight of the usability cycle for any technology. Consider any technology we have used and think about this curve, we will surely find this trend. Being a technocrat, I get highly excited by the technologies and the way we perceive it. In college we generally are quite skeptical to decide the projects and their scope. Gartner's Hype Cycle gives a great insight about what project you should choose. Try looking at the Gartner's Hype cycle and validate your college projects.

Sameer Mohanty

Founder, C.E.O, Creaxt Inc.

Data/Image Courtesy

https://www.gartner.com/

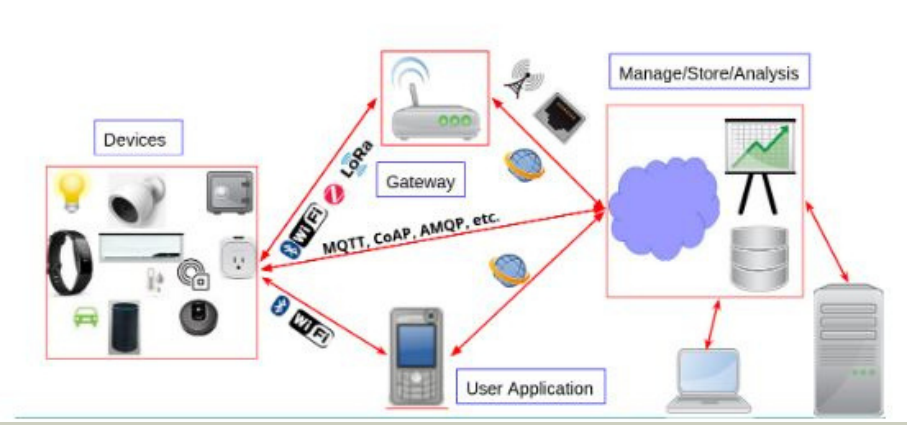
Importance of IoT Security

Ms. Asmita Jha

Today IoT devices have grown by many folds. The statistics from Review42 says that, “By 2025, the IoT trends suggest the number will rise to 75 billion devices.” To understand why it is important to give priority to IoT security, first of all let’s have a brief look at what is IoT and how things work in an IoT ecosystem.

Internet of Things (IoT) was coined by British entrepreneur Kevin Ashton in 1999. As per Wikipedia, “The Internet of Things (IoT) describes the network of physical objects—“things”—that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet.”

In simple terms, it’s basically the physical devices that collect the data from our surrounding at sensing layer , then at communicationation layer, this data gets communicated either to some other devices or any application. Then finally the collected data is stored , processed, analysed at the management layer depending on the kind of application. The diagram below shows the different scenarios in which IoT devices are connected, communicate and exchange data over the internet.



An IoT ecosystem comprises hardware device(s), firmware, communication protocols, network, web, mobile, and cloud applications. If any segment of this ecosystem is vulnerable, it can put your whole ecosystem at risk. Today, IoT devices have become part and parcel of many sectors including smart homes/cities, automotive, healthcare, industrial automation, retail, supply chain, etc.

The statistics taken from different sources as mentioned in the image below indicates a threatening scenario.

- 98% of all IoT device traffic is unencrypted.
- 57% of IoT devices are vulnerable to medium or high severity risks.
- 41% of attacks exploit device vulnerabilities.
- 47% of all vulnerable devices on home networks are cameras.
- In the first half of 2019, the number of cyberattacks on IoT devices increased by 300%.
- IoT devices experience an average of 5,200 attacks per month.

Source - https://unit42.paloaltonetworks.com/iot-threat-report-2020/
https://review42.com/hacking-statistics/
https://www.varonis.com/blog/cybersecurity-statistics/
https://www.comparitech.com/vpn/cybersecurity-cyber-crime-statistics-facts-trends/

Depending on the kind of application, the attack on IoT devices can have varying effects. For some real time, critical applications, attacks could be even life threatening. For some applications, attacks could be a threat to our privacy and information. Sometimes, it could be also a great threat to mission critical operations and the list of attacks has grown by many folds. I would just give an example of one of the latest attacks, “Ripple20”. It is a series of 19 zero-day vulnerabilities that affect hundreds of millions of devices. It was found in a TCP/IP stack that is widely used in embedded and IoT devices. The below image taken from the Ripple20 website, shows the range of applications that has been affected by these attacks.

Hence, it’s high time, developers/ manufacturers/ vendors/ consumers and all stakeholders of IoT devices must give priority to IoT security. Even before getting the product in the development phase, the security must be taken into consideration from the scratch phase of the product development. The developers responsible for developing applications/ firmware for IoT devices should be well aware of possible attack scenarios and attack surfaces for an IoT product and make sure to follow proper security guidelines/ best practices during development/ manufacturing/ supply chain and if any vulnerability disclosure comes, they should be responsible for releasing the patches and updating their consumers regarding the same. Even the consumers should be careful enough while choosing the product, setting the passwords (make sure passwords are unique and cannot be guessed), and keep the devices updated. It’s important to create IoT security awareness among all the stakeholders of IOT devices.

Different attack surface on IoT devices includes:

1. The device hardware: Hardware debug ports, storage of firmware and other sensitive info, bus communication, encryption, authentication, sensor interfaces, hardware interfaces, etc.
2. Communication: Authentication, encryption, protocol vulnerabilities, custom IoT protocols, radio communication-based attacks.
3. Cloud: Storage, communication, authentication, APIs, encryption, generic web/cloud vulnerabilities.
4. Mobile/User Application: Storage, communication, authentication, hardcoding, encryption, generic application vulnerabilities

There are various approaches and tools that can be used to attack different vectors. If you want to get a more in-depth understanding of the difference aspect in IoT security with practical implementation, I would suggest you to go through Payatu IoT bog series . The link of the first blog starts from - Link . It has more than 15 series that covers different parts of the IoT ecosystem (hardware, firmware, protocols, radio) and the methods, approaches for beginners to get started to IoT pentesting or to get the understanding of different scenarios in which IoT devices could be attacked.

Few of the IoT security guidelines / best practises that should be referred are mentioned below:

- OWASP IoT Top 10
- IoXt Alliance
- IoTSCF
- ETSI
- GSMA IoT Security Guidelines
- ISO62443
- NIST

Thus, it's important that insteading of just focusing on developing/ using IoT devices, we must give priority to secure IoT devices.

Panel Discussion on "Effects of Technology Advancements on Employability"

Panelist:

1. Mr. Vinayak Godse

2. Mr. Nitin Deshpande

3. Mr. Anand Thombre

4. Mr. Piyush Gupta

All the participating experts came from all parts of the industry and represent the entire value chain—from material research and processes to applications in various branches of industry emphasizing their character of technology in their domains respectively.
They answered the following and other questions in the panel discussion and gave very useful insights for the future generations.

How has the "Information Security" Industry changed in the past 5 years, and What would be the technology advancements in the next 5 years?
Vinayak Godse: He expressed his appreciation for the work that has been done to mainstream Information Security into development work. He added that everything today is digitized, so there's a lot of scope in the field of information security.

How the "software and service sector" changed in the past 5 years and what would be the technology advancements in the next 5 years?
Nitin Deshpande: He outlined the links between health and technology and noted the importance of mental health as an indicator of human development. He went on to describe how there has been a lot of changes in the Health Care Industry from past 5-7 years.

How has the health care and IT industry changed in past 5 years and what technology advancements are we expecting in the next 5 years?
Anand Sir: He presented his view on how we saw an evolution in the automation and supply chain industry. He also helped us to analyse this automation and technological advancements right from the time when there was a tremendous need of storage and data warehousing to the time today when everything we see is automated.

How has the "software and service sector" changed in the past 5 years and what would be the technology advancements in the next 5 years?

Piyush Gupta: As a Provider of IT, he said that with all the changes in consumer behavior and problem statements, Change in technology is inevitable. He discussed the traditional ways of thinking about IT and how everything is getting replaced in the function with a bolder, immersive version of IT that can drive a whole new set of innovations and possibilities.

As we all are in the middle of a pandemic, with so much of uncertainty around us we all have one common question in our minds. The Covid-19 outbreak is having a significant impact on every domain. What effects of the same did you experience in your field and how can we create new opportunities?

Vinayak Godse: He explained how companies are also increasing the use of technology while this pandemic. Further he stated that there will be a tremendous growth in the IT sector post covid-19. With this impact he continued to address that it will be a great opportunity for students who'd be starting their careers right after.

Nitin Deshpande: With the vision of health and technology together he explained how Telehealth and Teleradiology are two fields which have been using technology tremendously. Noting the Social media liberation, IoT and, Robotics he expressed how these have been useful recently.

Anand Thombre: He said that 2020 onwards supply chain industry would not just be limited to data warehousing, everything is expected to be automated and integrated and explained how it would be so. He enlightened how the industry has a shortage of the man power because and how drones and robotics would come as our saviours.

Piyush Gupta: By integrating a crisis with opportunity, he stated bigger the crisis, the bigger is the opportunity. He extended his point that even after the pandemic there won't be any loss to the IT industry much since IT industry is the support to all the core industries.

What will be your advice to the students who're looking for job opportunities right now, how can they build a rising career in these fields?

Vinayak Sir: He encouraged the participants that they should always thrive and look for better solutions for problems. He discussed how one should focus more on practical implementations rather than theoretical knowledge to survive in the industry.

Nitin Sir: Considering what students need now they should be focusing on end to end projects, he added how students should have a deep domain knowledge when applying for technical roles. In the end he said hard work and passion is what matters the most.

Anand Sir: He advised the students that with an increase in the competition and market demands, one should always be on top of his game. He added being smart, hardworking and will to be successful is the key to pivot anything. He supported students who are initially building their careers and mentioned that they should be flexible to new technologies.

Piyush Sir: Skill!Skill!Skill!! He morals the word skill and states that only upskilling yourself will lead you at your dream job. He further mentions building resilience helps to reach your goal. He encouraged the students that they don't have to build boundaries around themselves and explore out of the box and mentions agility is a very important aspect since everything else around is dynamic.

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THANK YOU, READERS.

-The Editorial Team
GYANAMRIT