



Department Of Computer Science
University of Delhi

श्रृंखला

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ABOUT SRIJAN

Srijan is the annual magazine of the Department of Computer Science, University of Delhi. It is launched every year at Sankalan.

Srijan literally translates to 'creation'. In the context of this magazine, it is the creation of new ideas, advancements and technologies in computer science and its allied disciplines.

Begun with the aim of presenting the latest developments in technology in a concise manner, Srijan has since evolved to provide not only a complete roundup of the emerging tech and research, but also examine their consequential social and psychological effects. With the intent to create a comprehensive journal unraveling the mysteries behind mind-boggling innovations, we present the most exciting inventions of 2021.

And since all work and no play makes Jack a dull boy, we also showcase the key co-curricular societies at DUCS, along with highlights of annual department events.

This year, Srijan showcases novel technologies being developed around the world, while also elucidating advances made in existing ones. Innovations gaining rapid integration in society are examined, and the magazine speaks of all the current development in computer science around the world.

FROM THE

HEAD'S DESK



Prof. Neelima Gupta
Head of Department

The developments in computer science seem to be ceaseless as evident by the phenomenon of our lives being integrated with innovation swiftly.

The products or the ideas that we have today seemed like a distant future not long ago. And the ones that may fill some people with scepticism today might be the ones creating a revolution in research and technology tomorrow.

From Google BERT to the Million Dollar Mystery and Bias in AI systems, last year has once again been mired with buzzwords revolving around new and technologically impactful innovation. Other than elaborating on the above mentioned buzzwords, this issue of Srijan covers a diverse range of topics. It talks about the real-world impact technology is making on Healthcare, along with fundamental innovations and practical deployments such as the Container Orchestration and GDPR, which are slated to revolutionalise the internet experience for billions of users around the globe.

As a person devoted to the furtherance of the dynamicity of this field, it gives me immense pleasure to see the students not just be involved and engrossed in computer science as an academic discipline but to be actively interested in putting their thoughts, understanding, and knowledge of the latest research into words. As responsible members of the society, it is also important to analyse and scrutinize details of every break-through that we come about. It is heartening to see the students have an independent perspective as they share their constructs.

Kudos to the authors, the editorial and the designing team for compiling this issue. I sincerely hope that Srijan will cover contemporary topics for its readers as we move forward in this next decade.

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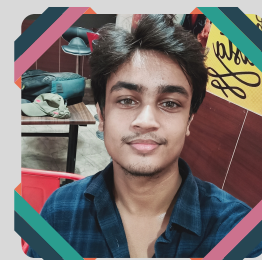
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FOREWORD

The Editorial team of DUCS takes immense pleasure to present the 11th volume of Srijan successfully, with all new enthusiasm and zeal towards a new era of computer science.

Keeping the ever-expanding sphere of technology in mind, we've tried to keep the content boundless, imaginative and inquisitive. A variety of topics like Olfaction Technology, 3D Bio-printing, Artificial Intelligence in Space Exploration and many more will keep you intrigued.

We profusely thank all the authors for their contribution to this magazine. Your willingness to share and spread knowledge has made this magazine possible.

We hope you enjoy reading this year's magazine.

SOCIAL MEDIA CLUB

Established in 1981, the Department of Computer Science, University of Delhi envisioned imparting quality education in the field of computer science via its various courses like MCA, MCS, Ph.D. programs, and other undergraduate courses. As a result, DUCS is not just a home to IT professionals and quality researchers but also recognizable talents like content writers, designers, dancers, music artists, and many more.

To expose this talent to the world, DUCS started Social Media Club in January 2021. Social Media Club connects the outer world to the department via its LinkedIn and Instagram platforms. The best part about Social Media Club is that being a student-initiated club, it nurtures the talent by challenging students in various possible ways to take the lead, present their ideas, work on organizational skills, refine their designing and writing, and much more which ultimately shapes them into a better person overall.

The LinkedIn page contains information on all the activities happening in the department, information on faculty as well as on the placements in various companies with the interviews of seniors who managed to crack those companies. This helps not only the students of the department but also the aspiring candidates to keep themselves updated.

Apart from that, Social Media Club tries to keep its followers updated with the latest news on technology which in turn, can help establish strong technical networks. Also, this can help establish an alumni network that provides long-term value to the institution by helping the juniors and alumni to stay connected and grow together.

While LinkedIn handles all the formal activities and information, one can easily keep track of all the day-to-day fun activities of the department via the Instagram handle. Be it updates on Fresher's party or titles of Farewell, updates on events of the annual tech-fest, or general fun memes, Instagram has it all.

Within such a short period since its commencement, Social Media Club has come a long way in the journey to achieving its goals. All this has been possible only because of the utmost dedication and consistency of students of the department only, and we have no lesser expectations from the upcoming batches. Hope they carry down the legacy and help the department reach new heights.

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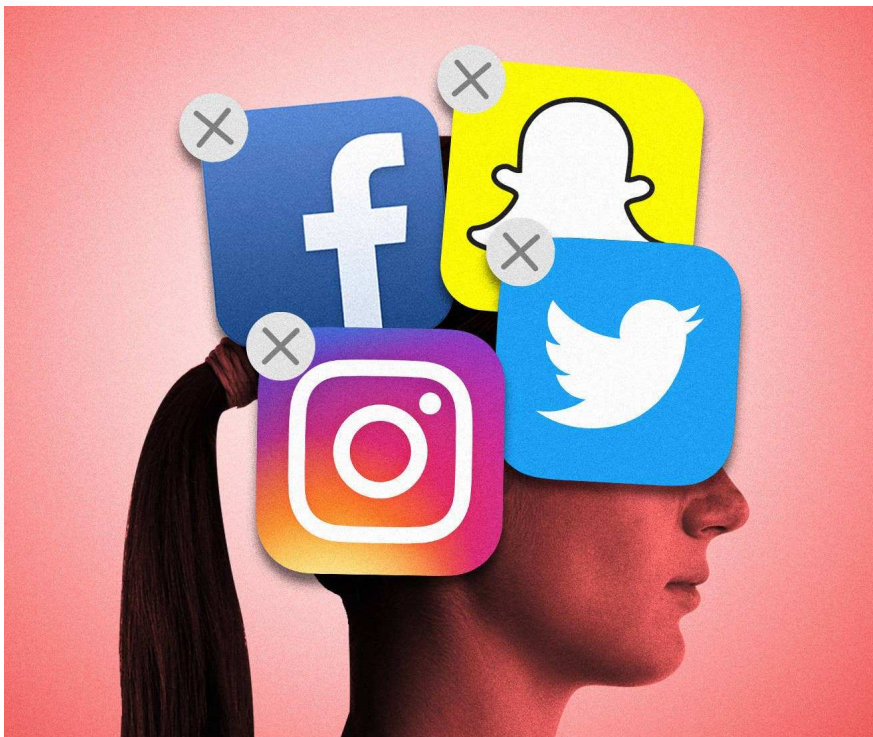
Social Media

AND

Human Psychology

Harsh Asrani

MSC 1st year



It is very well known and discussed how social media affects the human brain. It is proven to have reduced concentration span and results in increased anxiety and depression levels among the youth because of the "perfect life illusion." However, little is known about the effect caused by social media on the human brain and the perception of time.

Let us take a look at how humans perceive time. Just how optical illusions are distortions of our sense of time, temporal illusions are distortions of how we perceive time. It is far too often experienced by all of us to be ignored. It is also how we look at some events in the past and realize that it has been that long. It is realized when the fact suddenly dawns upon you that the movie you watched in the theatre and believed to be not too old is now more than a decade old. It makes you suddenly realize you are that old.

There are two ways we humans feel time – prospective and retrospective. When you have to guess and understand the passage of time, as it passes by, in the exact moment, it is feeling it prospectively. On the other hand, if you look back at the moment to judge how much time it took, how vivid your memory is of that moment, you feel time retrospectively. A couple of hours-long delays at the airport before a holiday looks pretty long, while an exciting week at the destination flies by. This is how you felt about those events prospectively; at the moment, those two hours felt extremely long while the fun week was short. However, when you think back about the holiday, the delay at the airport seems like a short while, whereas the holiday seems to be a much more significant part of your life. This is a pretty common pattern; prospectively, long tasks often take up a short span retrospectively, while on the other hand, the moment that flies by is often a long memory while you are looking back.

How you feel about an activity is determined by whether the activity is an empty or full activity. An empty activity is monotonous, unimportant, unstimulating to the person undertaking it, whereas a total activity is filled with sensations, novelties, and challenges. These are the kind of activities that actually make up your life, whereas the empty activities are barely. It is believed that prospective time feels fast when the activity is total because you are not focussed on time. You don't notice

it passing by as you are deeply engrossed in the activity itself.

Smartphones and the internet made information access and communication easier and faster, but along with that, they brought a new level and pace of exposure to ideas and conflict. However, this is not how we were biologically built. To physically adapt to all of this, we have to consume information in an increasingly dehumanized, decontextualized, and decentralized way, say an infinite scrolling webpage with an endless supply of memes, videos, and mildly relatable content. Each next bit of information is unrelated to the last, just how posts are, our participation is not acknowledged or assumed, just how likes for these posts are, and all this information is fed at such a rapid pace only through our eyes and ears.

In the pattern regarding short – long and long-short, the paradox created by social media is that it is short on both ends. You don't realize when the time passes by while you are using it, and you don't remember it afterwards as a significant. You don't feel bored during it, but it is not present in your memory as an important event. It burns our time on both ends. It feels shorter during and afterwards. What this results in is the wastage of time without any memorable moments. Potentially this can lead to a skewed understanding of time, which is a crucial innate skill. Thus, social media should be approached with extreme caution and restraint.

Olfactory Technology

Rishabh Poria

MCA 1st year




Imagine watching a YouTube video about the recipe to prepare your favourite dish, being able to smell it. Even better, consider reading an old novel and that 'woody', or as some might say 'earthy' smell, tingle your neural senses. Well, work towards olfactory technology has been going on for the past few decades.

Scentronix, a Netherlands-based start-up, already operates a perfume printing machine. The machine uses an algorithm to create a scent based on the answers to a questionnaire. But now, they want to make a wearable necklace, so that this immersive sensory experience can be made mobile. Scentronix, however, is not the first one trying to work on this. Poems of ancient Greece describe how doves' wings were scented, to spread the aroma of fragrant oils over people gathered for a feast. Perfumes and incense also play a significant role in religious rituals and ceremonies. Several attempts to screen films with scents started as early as 1916, when the annual Rose Bowl American Football screened in a cinema hall filled with rose oil. In 1939, at the World's Fair in New York, Smellovision presented a prototype with pipes attached to viewers' seats, and delivered smells in sync with images shown on the screen. The same scent technology was used in 1960 when Scent of Mystery got released. However, the technology didn't work very well because clearing an odour in time for each scene was not easy.

In 1991, Linda Buck and Richard Axel, who later went on to win the Nobel Prize for their work, in 2004, published that our sense of smell relies upon about 1000 different genes. These genes reside in a small area of tissue in the upper part of our nasal cavities. Each cell expresses a type of receptor but together, they allow us to detect around 10,000 smells. Debates on how exactly odour activates our olfactory receptors are still ongoing. One theory suggests that weak electrostatic forces between scent molecules trigger vibrational frequencies that get translated into electrical signals, through which data on that smell gets delivered to the brain. Another theory states that scent molecules act as a key in a lock system, much like substrates and enzymes. Other recent developments in this area include Scentee, a cartridge - powered

gizmo which went on sale in 2013, but was but was discontinued rather shortly, because people couldn't be bothered to refill cartridges for just a narrow range of smells. The founder, however, shifted his focus entirely and is now working on a device that directly stimulates the olfactory receptors via electrodes through the nostril. The lab results seem promising, but sitting with electrodes inserted into one's nostril is perhaps not an experience many would enjoy. Additional current issues include timing and distribution of scents, a somewhat tenuous understanding of human olfactory perception, the health concerns regarding synthetic odours, and many more. Nevertheless, one can hope that we figure out a way around these problems soon, since it can greatly enhance our multimedia experience.



Myths of BERT

Ashwani Varshney

MSc 2nd year

On October 25, Google released its much-anticipated algorithm update, namely BERT. BERT is anticipated to be a disruptive force, hailed as a significant milestone in search engine history. The backbone of this new update is Google's new technology, BERT, which it introduced in the year 2018. BERT short for Bidirectional Encoder Representation from Transformers. Here, transformers refer to models that interpret the meaning of conjoining words concerning each other. It means that now the search engine giant can understand the proper context and semantic of a search query by analyzing the correlation of words and offer better search results. It is a massive bonus for users and goes a long way in establishing user's trust and more excellent brand value.



What is BERT?

BERT is Google's latest deep learning algorithm related to Natural Language Processing (NLP). Using the BERT algorithm, Google can better understand search queries as BERT can decipher the exact semantic and context of the words used in a phrase or sentence. According to the search engine expert Bill Slawski, BERT is an NLP pre-training approach used on a large body of text. It manages tasks such as Named Entity Recognition (NER), part-of-speech (POS) tagging, and answering the questions, among other natural language tasks. BERT aids Google in understanding natural language text from the Web. Google has open-sourced this technology, and many have created variations of BERT.

How will Search Engine Optimization be affected by BERT?

Of course, BERT will impact rankings and featured snippets like other Google algorithm updates, but the good news is that Google will not use BERT for all queries. Currently, BERT will be used only in 10 percent of searches in U.S English. As per Google, BERT is exceptionally complicated in that it pushes the boundaries of Google's hardware; therefore, it has been constrained to fewer searches.

Google is deploying the BERT model in 24 countries where featured snippets are used to improve the quality of the snippets. So, there will not be significant

upheavals in the search ranking; however, after the post-full-fledged implementation of BERT, website owners have to develop highly optimized content to better rank on search engine pages.

The myths surrounding BERT update

Despite clear indications from Google, many failed to understand the BERT update in its entirety, which resulted in the unwanted content that disseminated information that was nothing but myths. Now, it is time to bust those myths and get an accurate picture. Let us have a look at some of the myths that made headlines.

1. With the BERT update, one will have to optimize the website for long-tail keywords.

It is one of the most pervasive myths about BERT. BERT understands search queries, including those written in natural language and those with prepositions and "stop words" that add to the semantic of the query. Some people have misconstrued this fact and assumed that it is now essential to optimize internet sites for long-tail queries. Nevertheless, BERT was designed to understand users' intent and connect to the information on the websites. There is no need to overhaul the content –continue writing great content, as always.

2. BERT increases the significance of stop-words.

Stop words are the words that are typically preprocessed by NLP tools. Although there is no universal list of stop-words, they are the most frequently occurring words in a language. As mentioned, BERT interprets those queries better, which are written in natural language and that use stop words. Some articles have misconstrued that stop words are more worthy now and should be included in the content. Updating the content to add more stop words will not help the SEO in any way.

3. The BERT update is not that significant

Well, what can be said about such obliviousness? BERT is already affecting ten percent of English language search queries. Is this not a significant number? The perception that the BERT is a minor update is likely a reflection that it is not shaking up many keywords. Instead, it is assisting with keywords that may have been misinterpreted previously. Depending on the interpretation, one might consider BERT to be relatively large (because it affects about 10 percent of queries) or relatively small (because it has not reshuffled many valuable two- to three-word phrases).

4. BERT is the most significant update of all time

It is based on a press release from Google that stated that it is one of the quantum leaps forward in the history of search engines. Even in this statement, BERT

remains one of the It is based on a press release from Google that stated that it is one of the quantum leaps forward in the history of search engines. Even in this statement, BERT remains one of the most extensive updates and not an all-time big update.

With Google's BERT update, the search engine can understand the nuances of language and is undoubtedly a massive step in delivering the search results. In this procedure, Google will provide its users with a first-class search experience. BERT will alter Google's search page ranking as the update is applied on only one out of ten searches; now, the effect seems minimal. However, it must be noted that once the full implementation of the BERT update, content creators have to tighten their backs to come up with unique and highly optimized content to rank better on result pages.

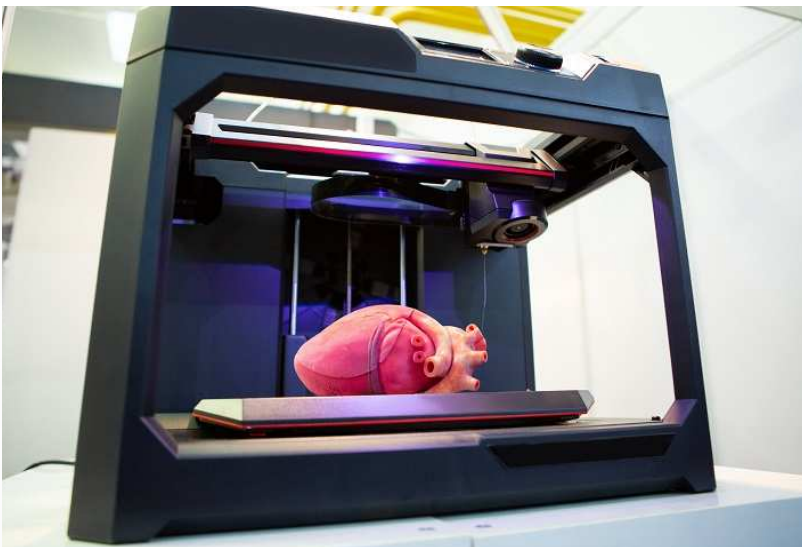
Although Google aims to improve the search query results with BERT, understanding the entire language is still challenging. Despite the efforts undertaken, BERT might not get everything correct just yet. However, the industry giant is poised for similar efforts to enhance the search results and provide a great user experience. This deep neural network-based technique for NLP tasks helps the algorithm understand the context and subtleties of users' queries. Eventually, the goal is to deliver more relevant results to the end-users while encouraging them to use natural language rather than keyword-heavy queries.

3D Bio-printing:

The beginning of a new era?

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MCA 1st year



In recent years, 3D Bioprinting has emerged as a promising approach for tissue regeneration. Medical professionals and engineers are now able to 3D print prosthetic hands and surgical tools. Bioprinting has begun to transform the field of tissue engineering and medicines.

The origins of bioprinting can be traced to the early 1980s, when Charles Hull, an American engineer, built the first 3D printer. The idea was to deposit successive layers of an acrylic-based photopolymer and simultaneously cross-link using UV light, thus creating a solid 3D object. This 3D printer was capable of printing solid model objects fashioned using computer-aided design (CAD).

The ultimate goal of bioprinting is to replicate functioning tissues and materials such as organs and transplant them into human bodies. It utilizes 3D printing techniques to combine cells, growth factors and biomaterials, to fabricate biomedical parts that maximally imitate natural tissue characteristics. It involves layer by layer deposition of bio-inks, consisting of living cells, biomaterials, or active biomolecules, to create tissue-like structures that can be used in the fields of tissue engineering and medicine.

Bioprinters have three major components: the hardware used, the type of bio-ink, and the material it is printed on (biomaterial). There are different technologies for 3D bioprinting, three of them being inkjet, laser-assisted, and extrusion printers. Inkjet printers are usually used in bioprinting carried out for fast and large-scale products. Laser printers provide high-resolution printing; however, these printers are pretty expensive. Extrusion printers print cells layer-by-layer to create 3D constructs. Though the technology initially had limited applications, it is now widely used in dentistry, prosthetics, and products involving biological components, including human tissues.

Nonetheless, scientists are still far from 3D printing organs, as it is unfeasible to connect printed structures to the vascular systems that carry life-sustaining blood and lymph throughout our bodies. They have been successful in printing non-vascularized tissue, like certain types of cartilage. They can also produce ceramic and metal scaffolds that support bone tissue, by using different types of bioprintable materials such as gels and certain nanomaterials. Several promising animal studies suggest that the field is getting closer to its ultimate goal of transplantable organs. And while perfection is yet to be achieved, scientists at Tel Aviv University have already managed to build a 3D-printed heart that contains cells, blood vessels, ventricles, used cells

and other biological materials. In the United Kingdom too, a team from Swansea University have developed a bioprinting process to create an artificial bone matrix using durable and regenerative biomaterial.

Bioprinting is a novel technology that is providing promising results in the field of tissue engineering and medicines. The choice of each bio-ink component and its concentration can lead to specific biological and mechanical characteristics, for optimal formulation to mimic the native tissue. Scientists are trying to find ways to reach the ideal bio-ink for every tissue type. It would be revolutionary if scientists successfully manage to print a working 3D-printed organ that can be transplanted to a human body, as that would decrease the number of patients waiting for organs, possibly even eliminating such wait. Bioprinting is a means to venture into a new era, where almost all real organs may be imitated using this not so extraordinary, yet innovative, technology.



Exploration of Celestial Bodies and AI

PAYAL SAHA

MSC 1st year

A brief history of space exploration

Human beings have always been curious about what exists beyond Earth. Though many famous mathematicians, astronomers and scientists like- Galileo Galilei, Edmond Halley, Christiaan Huygens, Albert Einstein and many more, had already contributed in providing theories about the unexplored space (which are still unchallenged), it was only in 1957 when the satellite Sputnik, developed by the Soviet Union, was launched and successfully placed in the Earth's orbit. Thus began the space race. Since then, many satellites and space probes have been launched for data collection and space exploration. Today, nearly 3000 satellites are orbiting the Earth.

Evolution of technology

Beginning in the mid-1960s, the US defence agency designed and built a network of computers, known as ARPANET, after which researchers began to assemble the network of networks that form the modern Internet. With the evolution of computers and AI, in particular, it is very much possible today to not only use satellites for large data collection, but also to send rovers to planets, and launch space probes to explore farther into outer space.

Present technology for communication in space

At present, radio telescopes (used to receive data) feature specialized antenna and radio receivers, which are employed to detect information transmitted as radio waves, by satellites placed on the Earth's orbit by robotic spacecrafts (space probes). In radio communication systems, data is relayed across space using radio waves. At the sending end, the information to be sent is converted by transducers to a time-varying electrical signal called the modulation signal.

One of the foremost notable developments came in 1946 with the introduction of the technique called astronomical interferometry, which suggests combining the signals from multiple antennas so as to simulate a larger antenna, in order to achieve higher resolution.

There are DSN (Deep Space Network) locations setup by space organizations like NASA. These sites are almost evenly spaced around the planet so that we never lose sight of a spacecraft even when the Earth turns.

How does a Space Telescope receive images?

Space probes are generally designed to capture and transmit images as data. Cameras on many telescopes and space probes use a charge-coupled device (CCD), which collects the light that is emitted by or reflected off objects. The CCD is a thin wafer of silicon, divided into hundreds of thousands of tiny light-sensitive squares. Each square corresponds to a pixel in the final image, and more pixels contribute to a more detailed image. The light-sensitive squares on the CCD that line up with bright objects in the field of view will collect more photons, making those pixels appear brighter in the resulting image. This brightness is measured in greyscale, ranging from 0 (black) to 255 (white). Thus the recorded image in the telescope is black and white. To measure colour, different filters can be placed in the light path of the telescope, where each filter is designed such that it allows only certain wavelengths (colours) of light to pass. Multiple images of the same object are captured by using a variety of filters, after which the images are combined by scientists to make a comprehensive coloured picture.

Some of the notable exploration missions include The Voyager Program by NASA, in which two robotic interstellar probes, Voyager 1 and Voyager 2 were launched in 1977 to explore the distant planets in our solar system. As of 2021, the two Voyagers continue to be in operation, gathering and transmitting useful data to Earth.



AI and ML in space exploration

With the growth of AI and the emerging need of automated systems, AI and ML have become an integral part of the engineering and research wing of space organizations around the world. Some of the recent projects by ISRO have made massive use of AI technologies.

In 2019, ISRO launched Chandrayaan 2 spacecraft into the Earth's orbit as part of the second lunar mission, using Geosynchronous Satellite Launch Vehicle Mark-III (GSLV Mk - III) as the launch vehicle to carry the spacecraft. The spacecraft comprised of the Orbiter, the Lander - Vikram and the Rover - Pragyan. Pragyan is a six-wheeled robotic automobile and is able to conduct in-situ payload experiments. It's powered by AI tools and frameworks, uses solar power for its functioning, and can communicate only with the Lander.

The ISRO's Mars Orbiter Mission (MOM), also known as Mangalyaan, launched in 2013 and has extensively used automation that has allowed the spacecraft to revive contact with the Earth's receiver even when communication blackouts, lasting a few minutes have occurred.

Future of AI in space technology

Even though the future of AI itself cannot be commented upon, it can be observed how AI has been extensively used in recent years, be it in improving navigation systems, global communication or simplifying the exchange and processing of data. Though it is estimated that only about 4% of the visible universe has been explored so far, nevertheless, with the emergence of new technologies and ongoing efforts, researchers are expecting to understand the silence of space someday.



You Version Your Code Why Not Database?

Kajal Gupta
MSc 2nd year

For software engineers, it is almost impossible to work without versioning their code. The importance of versioning and tracking the history of code changes is long understood in software production. For a long time, database version control was infeasible, but it is no longer the case. Now, database development teams can also catch the benefits of version control. So here I am sharing some of the reasons why you should version your database code.

1. Code Changes can be easily shared within a team

Using a version control system to store database code makes it easier to manage the work of the teammates that are responsible for the database. It is crucial for teams located in different locations to be able to share and handle changes quickly. Item locking, for example, helps you avoid disputes and function more efficiently without stepping on each other's toes.

2. Improve your understanding of the production pipeline

A version control system shows what development work is being done, how far it is progressing, who is doing it, and its reason. Version control keeps comprehensive changelogs and is often used in conjunction with issue tracking systems.

3. Retrieve Previous Versions of the Database

Although you should always have a secure backup plan in place, putting a database into version control often makes it easier to back up the SQL code. Version control provides a risk-free sandbox since the history it provides is gradual. It allows developers to experiment with new solutions and roll back safely in the event of errors.



4. Demonstrate Compliance and Monitoring Effortlessly

Change monitoring in version control is the first step in getting the database ready for compliance and a vital step in keeping an audit trail consistent and managing risk. Complete revision of a database or database object would be available to check the person who made the changes, the time, and the reason behind the changes.

5. Database Automation could be Achieved

Change management becomes more manageable with a single version of truth for database code. Complex procedures become easier to automate and replicate, and deployments become even more stable. As code is checked into Source Control as the basis for DLM Automation's automated builds and tests, bugs are discovered sooner, and higher-quality code is ultimately shipped and deployed.

6. Synchronize Application and Database Code Changes

Database updates can be integrated with application code changes if the database is maintained with version control alongside the application. You will still know which version of the database corresponds to which version of the application is being used. This direct integration aids in better communication between teams, increased productivity and troubleshooting.

Summary

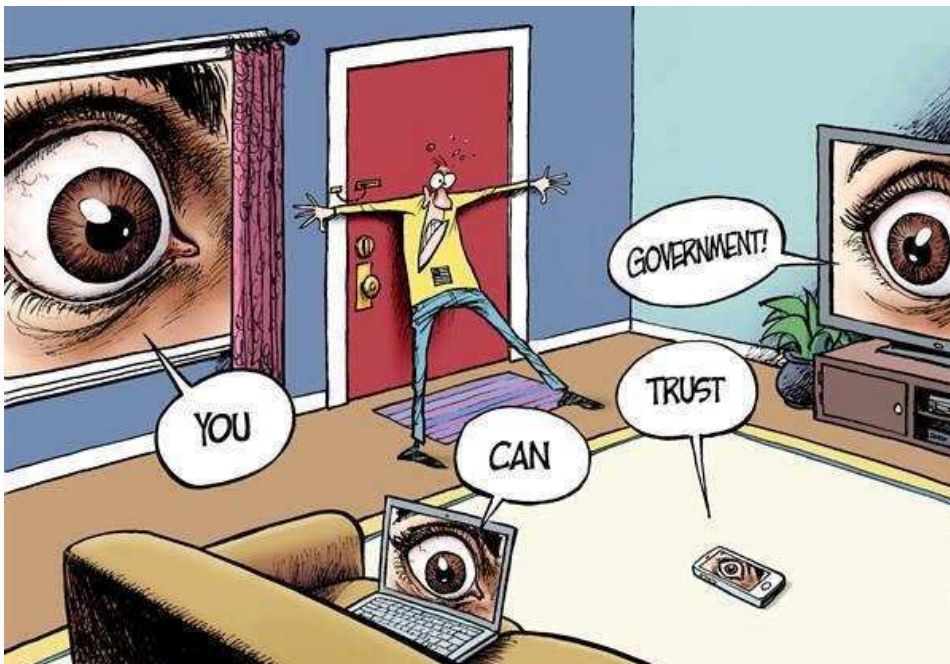
While it is true that database version control was not always achievable, the availability of tools like Liquibase, SQL Source Control, etc., means there is now no reason why the percentage of companies and organizations versioning their database code should not be higher. If you are not currently versioning your database, one of the six reasons mentioned above may persuade you to do so.

Digital Surveillance:

A Security Blanket for the Cyber Age
or a **Threat to Privacy?**

Arpita Sagar

MCA 2nd year



As artificial intelligence becomes increasingly ubiquitous, and human dependence on automation proliferates, a niggling worry plagues the current generation - Where does one draw the bounds of internet privacy? Indeed, does a clear frontier actually even exist, or is it just blurred lines?

The exchange of data and services forms the cornerstone of many new and exciting technologies. However, at the same time, the ability of governments and companies to keep people's activities under surveillance has never been greater. A growing number of states are employing advanced AI surveillance tools to scrutinize, and possibly even censor citizens, in order to accomplish a range of policy objectives. While some may be lawful, others descend into a cesspit of human rights violations, and most fall into a murky middle ground. The ever-increasing efficiency of algorithms, combined with the lust for power around the world, suggests that the collection of vast quantities of data may lead to catastrophe.

There is growing concern around the world that digital profiling is shaping business models. Digital rights groups such as Reporters Without Borders and the Electronic Frontier Foundation have expressed trepidation regarding mass surveillance, warning that such measures restrict political and personal liberties. Such fear has resulted in legal challenges, such as the *Hepting v. AT&T* case in the USA, which examined the role that telecom provider AT&T played in assisting the National Security Agency's unlawful monitoring of communications, or the Levenson Inquiry in the UK, which investigated the



practices and ethics of the British press, following the News International phone-hacking scandal. On the illicit front, hacktivist group Anonymous has often hacked into government websites to convey their dissent.

Yet, even as the argument in favour of preserving digital privacy looms large, so does the one in favour of monitoring, albeit limited. Network surveillance is essential to monitoring Internet traffic, which helps keep transactions secure. Corporate surveillance ensures adherence to company policies and prevents misuse of resources and potential lawsuits, while state surveillance can enhance maintenance of societal harmony, as well as disruption of criminal activities. Because a society in which each individual

conforms to every law, while also circumventing every social anathema will always cease to exist, establishments must employ some method to guarantee a degree of social and cultural conformity. And that process will inevitably violate some definition of privacy. Undeniably, for most, the persisting issue is defining the confines of scrutiny, rather than curtailing it entirely.

How this modern social contract will be established in this era of accelerating reliance on technology, is a matter which elicits endless, yet never banal, discourse, and will be vital in shaping societies of the future.

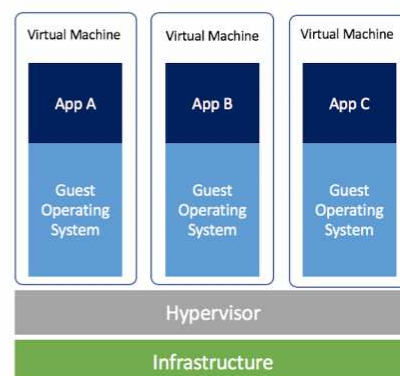
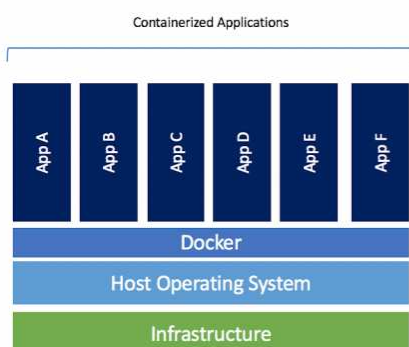
Container and Container Orchestration

Adarsh Yadav
MSC 1st year

Consider working on a project and it works fine in one's machine, but when the same project is run on any other machine it doesn't work. This can be because of any dependency, or because of a different version of a library. Containers can prove to be helpful here.

A container is a standalone package that encapsulates application code and all of its dependencies, so that the application can run in any environment. Containers give you portability, isolation, and packaging. Just wrap everything inside an image (containers are running instances of images), and other users can directly run this image. Containers can be thought of as lightweight, scalable, and isolated Virtual Machines (not an actual VM) in which one can run their applications.

To illustrate the concept of containers further, suppose a developer is working on a web application that requires PHP 7.2. So, he installs PHP 7.2 on his local machine. Later, he updates the app to use PHP 7.2 to 8.0. As a result, all the developers working on the same web app will also need to update their versions of PHP. If some more such libraries or dependencies are updated, all the developers will need to update everything again. But with containers, only one developer needs to update everything and create a new image; all the other developers can use that image, since it contains all the updated libraries and dependencies inside it.



In the figure on the right, in the absence of containers, each application is running its copy of the OS (Guest OS). Whereas on the left, the containerized applications share the host OS and are hence, much more efficient and lightweight, and take less time to start. There are varieties of container runtimes available like Docker, Rocket etc. Docker is the most popular container runtime in use.

Container Orchestration

There are multiple container orchestrations available, like Kubernetes and Docker Swarm, which automate container operations. Kubernetes is the most popular container orchestrator. Developed by a team at Google, it was later donated to the Cloud Native Computing Foundation (CNCF) and became open source. It eliminates many of the manual processes involved in deploying and scaling containerized applications. One can cluster together groups of hosts running containers, and Kubernetes helps one manage those clusters efficiently

To understand the concept of Kubernetes and what can be done with Kubernetes, consider the case of a shopping website.

Case 1: Suppose a server is hosted only in the Delhi region, to handle all requests from India. But due to some reason (like hardware failure), the server goes down,

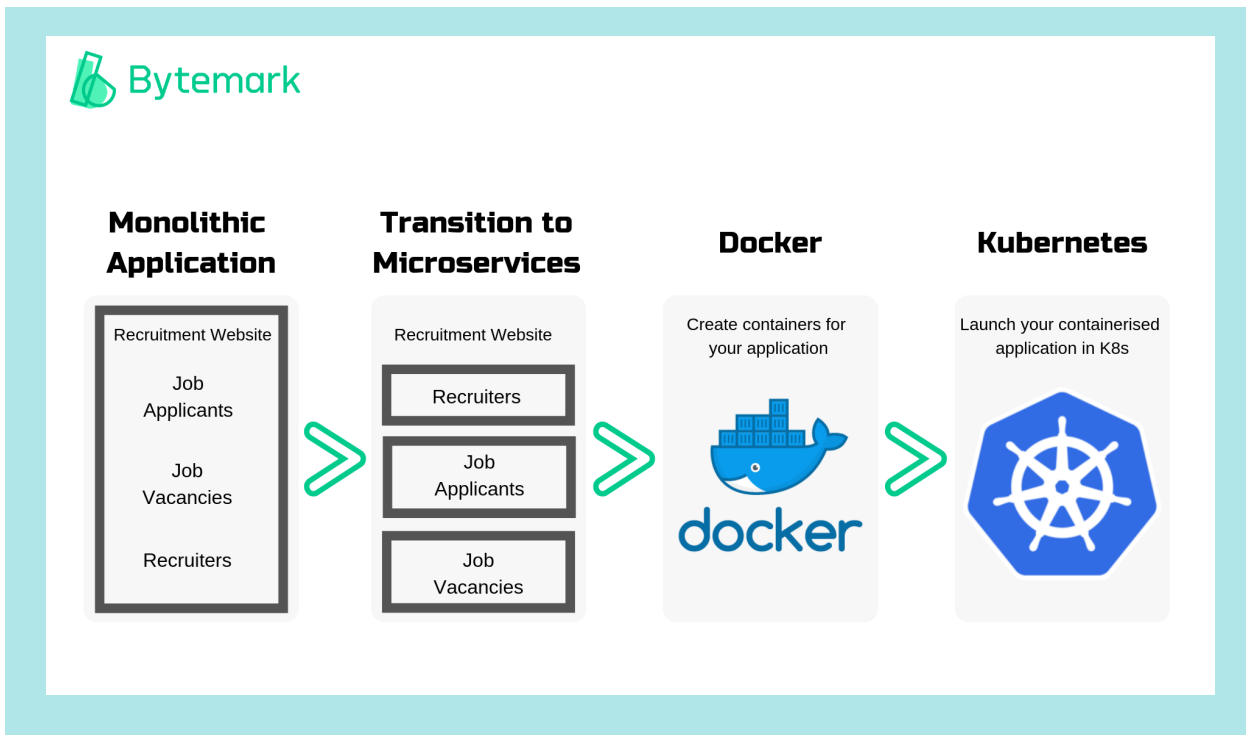
implying that the site goes down as well. Therefore the website should be hosted in multiple regions in India like Delhi, Mumbai, and Kolkata. This is called high availability. Problems like hardware failures do not bring the application down, because there are multiple instances of the application.

Case 2: Suppose there is a very high load on the Delhi server. This can be handled by sending traffic to other servers. So load balancing is needed to balance the traffic in all the regions.

Case 3: Suppose there is a sale and the server traffic increases in all the regions. So the server needs to be scaled to handle all the traffic. Once the sale is over, they need to be scaled down again to prevent wastage of resources. Therefore, a method to easily scale up and down according to requirements is required.

Case 4: Suppose the website has to be updated during the sale, and that needs to be done without any downtime. Here, zero downtime deployment is needed.

Case 5: As the payment service goes down, none of the other services in a microservice architecture (see image) should suffer. A Health check and Self-healing for all services can achieve this. If anything goes down, it automatically heals, which means automatic restart of the service.



Using Kubernetes, one can solve all the above problems. There are lots of other features available for exploration as well. It is open-source, used by different organizations, and lots of new features are added in every version. Many companies are getting a head start on Kubernetes and joining the revolution. By using containers and container orchestration, organizations can build and deploy horizontally scalable lightweight applications across multiple types of server hosts, cloud environments, and other infrastructures more effectively and efficiently.

Bias in AI Systems

Saachi

MSc 2nd year

With the surge of the fourth wave of the Industrial Revolution, machine intelligence, blockchain-based decentralized governance, genome editing and AI in healthcare are among the top trending arenas, and have grabbed the interest of researchers and enthusiastic techies. But despite their enormous impact on industries, they also pose new ethical challenges. Curious?

Biases in the psychological world are quite common. Humans are more or less always inclined towards a certain object or an opinion. But can one agree with the thought of an algorithmic model favouring something over the other? Being able to generalize a problem over a set of inputs represents the key characteristic of a machine learning algorithm, meaning it must be able to correctly predict the outcome for new data, based on insights gained from previous data. But if the incoming data contains unseen features, the algorithm will have trouble identifying what this new data is. If this all sounds a bit abstract, here is a quick example. Imagine developing an image classification model, for identifying a cat or a dog. In the training phase, it is fed hundreds of thousands of labelled images of dogs of different breeds, but very few of the different breeds of cats. Thus, it is very likely for the model to misclassify an image of a persian cat as that of a dog. The model is not generalizable enough to all cat breeds, because it has not been trained with the sufficient images of cat breeds. This represents a bias in an image classification problem.

The Root Cause

Data imbalance is one of the major factors in introducing bias. In 2016, Microsoft unveiled an AI-based conversational chatbot on Twitter to interact with people. However, within a few hours of its release, the replies became quite offensive, and loaded with racist messages. The chatbot was trained on anonymous public data and had a built-in learning feature, which led to a coordinated attack by a group of people, allowing introduction of racism in the system.

The episode was an eye-opener for many, of the potential negative implications of unfair algorithmic bias. Class imbalance is the another leading issue in many classification problems. Researchers and developers may also share some blame, termed human bias.



Prevention Measures

Awareness and good governance can help prevent machine learning bias, by cultivating the best practices to mitigate it. Selecting a representative sample will counteract common types of machine learning and artificial intelligence biases. Also, continually monitoring systems as they learn and execute can help ensure that biases don't sneak in over time. Additional resources, such as Google's What-if Tool or IBM's AI Fairness 360 Open Source Toolkit, to examine and inspect models, will be a step towards trusted AI.

Primes and the Million Dollar Mystery

Nidhi Sangwan

MCA 1st year

Knowingly or unknowingly, every person encounters prime numbers in their lives, due to their prominence in fields such as Information Security, Quantum Physics and most importantly Mathematics. Prime numbers have been studied for years and many prominent mathematicians have contributed towards the same. The Greek mathematician Euclid proved in his theorem 'The Infinitude of Prime Numbers', that there exist countably infinite primes. He also stated that every number is either a prime or the product of prime numbers, in his Fundamental Theorem of Arithmetic. Other theories state that there exist infinitely many pairs of prime numbers which are only two units away from each other. Even after so many theorems and proofs explaining the nature of prime numbers, one of the most important unsolved problems in mathematics is the Riemann hypothesis. It is one of the millennium problems of the Clay Institute, and the person who solves it can win a million dollars.

In the hypothesis, German mathematician Bernhard Riemann concerns the pattern and distribution of prime numbers, which has a strong connection with the Prime Number Theorem in Number Theory. The Prime Number Theorem, which Riemann first tried to prove when he was proposing his hypothesis, states that for large values of x , $\pi(x)$ is approximately equal to $x/\ln(x)$, where $\pi(x)$ is an approximate value for the number of primes between 0 and the number x . However, no function yet exists that tells the exact location of each prime number on the real line.

The Riemann hypothesis states that the zeros of the Riemann Zeta function, which is used for investigating properties of prime numbers, exist on a specific line in the complex plane. However, the Riemann Zeta function, being a complex-valued function, makes it difficult to determine these values. At present, almost 100 billion of the infinitely many zeros have been observed, and they all satisfy the Riemann hypothesis. The Riemann Zeta function equates to zero for all negative even numbers known as trivial zeros, but these are not the only zeros. The other ones, known as nontrivial zeros, are the main concern as they exhibit a very compelling pattern, which is the central theme of the Riemann hypothesis. Riemann explained in his 1859 paper that all of the nontrivial zeros

of the function lie inside a single region between 0 and 1, on the real axis called the critical strip. He hypothesized that they do not just lie somewhere in the strip, but on a single vertical line whose real part equals $\frac{1}{2}$; this statement is the Riemann hypothesis. This vertical line, known as the critical line, is located in the centre of the critical strip. Zeros of the Riemann Zeta function yield impressive results concerning prime numbers and related objects in number theory. So if the Riemann hypothesis is proven correct, the exact location of prime numbers can be predicted

Hundreds of theorems exist whose base is laid down on the assumption that the Riemann hypothesis is true. Consequently, if the Riemann hypothesis is disproved, all of these theorems will collapse, and it would be a disaster for mathematics as we currently understand it. The hypothesis has implications in other fields as well. Research has suggested that the locations of the zeros of the Zeta function might have importance in Quantum Physics. However, the significance of the Riemann hypothesis in the field of information security and encryption pales the same for other fields. Prime factors of a natural number greater than one can be determined by creating factor trees. But for larger numbers, it requires a lot of time and hard work to find each factor until only prime numbers are left, as this can only be accomplished by an algorithm with a runtime complexity of the square root of the input. Trying to factor a number greater than the immense Graham's number would take a lifetime;

even supercomputers are not that efficient in the factorization of such large numbers. Modern encryption methods take advantage of this weakness and open up a whole new branch of mathematics and computer science, i.e., Cryptography.

Proof for the Riemann hypothesis can lead mathematicians to obtain easier and optimized methods to locate larger primes. It could have the potential to cease the use of current encryption methods. If one already knows where the primes are, then instead of trying every number, one only has to pick the zeros of the Riemann Zeta function. Because of that, many systems that are intended to be secure, such as military-government communications and banking transactions, could potentially no longer be protected. Mathematicians and scientists have worked for years and dedicated their lives to the pursuit of this knowledge, but is it right to pursue something that can negatively impact information security? We are still nowhere close to the proof for the Riemann hypothesis. However, knowing its potential and its effect on modern encryption methods might encourage computer scientists to develop more secure and more advanced encryption algorithms, and reduce the dependency on prime numbers, thereby encouraging further innovation and progress in the field of Network Security.

Computer Aided Education

Dilpreet Kaur
MCA 2nd year

Among the various sectors that have benefited from the adoption of technology amidst the COVID-19 pandemic, education has been an active front runner. This situation has transformed computer-based education from an optional tool, to a mandatory tool of continuous learning.

What is CAE?

Computer-Aided Education (CAE) refers to the use of the computer as a tool to facilitate and improve education. It enables students to learn from a combination of technology and the printed curriculum. This is to ensure a more interactive learning experience, contributing to the overall success of the learning strategy

Types of Software used

- Drill and practice software is generally used the same way that worksheets or flashcards are used in classrooms, to provide feedback to the students. Flashcard Deluxe app is the best known example of this type of software, and provides the user with review opportunities and feedback as they answer questions.
- Tutorial software is an instructional sequence on a topic, similar to the teacher's instructions in the classroom. They are meant to be used as a self-contained, supplemental, instructional resource.
- Problem-solving software focuses on developing analytical, observational and logical skills. Some examples include MindManager, Layered process audit software, etc.
- A simulation is a representation or model of a real event, object or phenomenon, where learners can see the results of their actions. This is a very powerful application of computers and the educational community can capitalize on this type of software. Examples of this kind are AnyLogic and MATLAB.

Games are the best way to learn and grasp concepts. Many games are knowledge-specific as well as fun. Scratch can be considered as a great example of this type of software, which provides colorful blocks and cartoon characters to teach coding to kids. Grammar Gorillas, Geoguesser are some other examples.

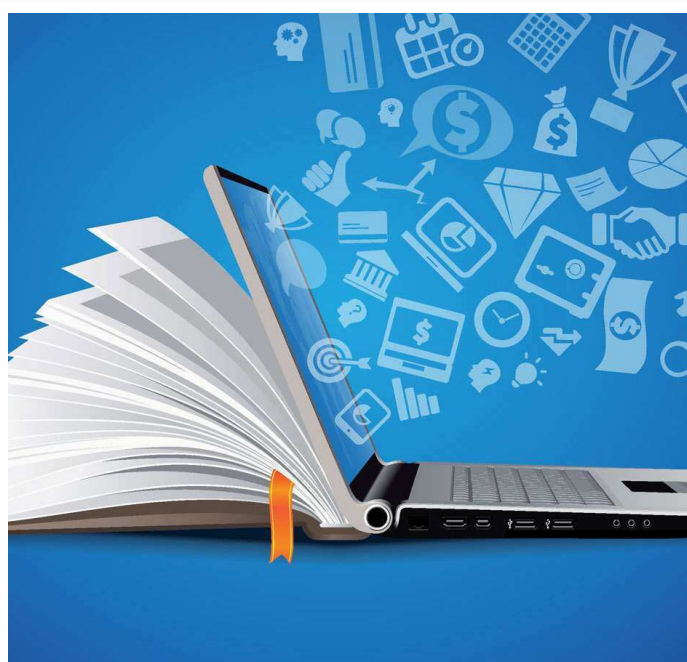
Advantages of CAE

- **Self-paced learning** : CAE is individualized and students can learn at their own pace, which eliminates peer pressure and accommodates both fast and slow learners.
- **Self Evaluation:** CAE provides a reporting system through which students can analyze their progress. Many tutorials come with progress bars and deadlines, that provide evaluations of learning from time to time and help students avoid procrastination.
- **Structured Content:** Content on the Internet is scattered, and finding the right thing wastes a lot of time. CAE provides information in a structured manner, increasing learning efficiency.
- **Visualizations:** Difficult concepts are made easy with the help of visuals, improving retention of knowledge and reducing teaching time.

Drawbacks of CAE

The most important objective of CAE is that the students should learn and understand what is being taught; this can often be hindered by other, exciting features

that computers can provide. Avoiding distractions is a challenge, and the teacher should impose limits on student and computer interaction. Further, financial problems may refrain some students from owning a computer, placing them at a disadvantage. Content and tutorials getting outdated, as well as technical difficulties like network issues, are also obstacles to CAE. Additionally, though some software like simulation permits the execution of chemical and biological experiments, hands-on experience is missing in these cases.



Conclusion

Computer-aided education has the potential to transform the educational process, and greatly improve the efficiency of learning. But even with all the great features CAE has to offer, caution must be exercised to prevent overuse of multimedia in instruction. A balance must be worked out to harness CAE's full potential.



Passwords, Authenticators

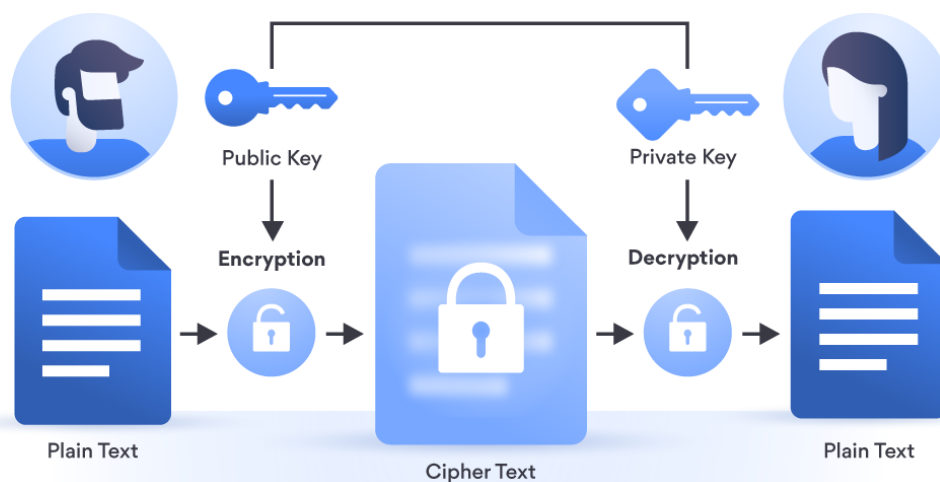
And

Asymmetric Cryptography

Kavita - MSc I year
& Ankit - MCA 1 year

Passwords have been used by humans since ancient times to ensure secrecy. With the introduction of the Internet, these passwords naturally transitioned to the web, and are used to authenticate users across applications. However, multiple accounts across various applications mean maintaining these passwords is a tedious task. Many use the same password across applications, leaving them vulnerable to data breaches through attacks such as phishing, brute force attacks, or the use of keyloggers. Thus, there is a need for stronger, user-friendly authentication that accurately verifies the user's identity and eliminates the risk of compromised credentials.

Asymmetric encryption



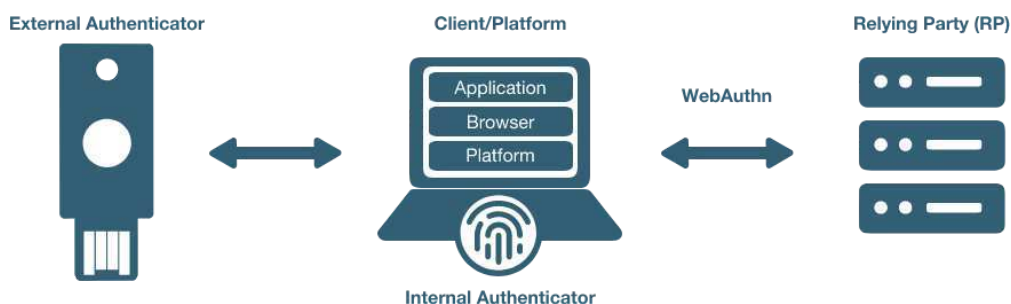
Certificate Based Authentication

Security researchers Ron Rivest, Adi Shamir, and Leonard Adelman came up with the RSA cryptosystem in 1977, named after its developers. RSA is an asymmetric cryptography algorithm that calculates a key pair using some mathematical computation and then splits it into two pieces: the private key and the public key. After generating a key pair, the private key holder shares the public key; the public key can then be used to encode secret messages that only the private key holder can decrypt. The reverse is also true, i.e., one can encrypt a message with the private key that can only be decrypted by the corresponding public key. Both keys encrypt to different hashes, but one key can decrypt the other's encryption. Even if a third party decrypts a message using the public key, they cannot change the content of the message because they don't have access to the private key. In other words, the message is digitally signed, as it would be in the real world.

In certificate-based authentication, digital certificates (an electronic document that is used to prove ownership of a public key) and signatures are used to confirm the identity of a user or device before being given access to a resource. This is the basis of Public Key Infrastructure (PKI), and this form of authentication is called certificate-based authentication. This is a password-less authentication method. Certificates are themselves encrypted and can only be decrypted with the private key pair (which is never shared), so even if the user accidentally authenticates a rogue network, the data that is sent is worthless to the attacker.

Moving to Authenticators using WebAuthn

The FIDO Alliance, a collection of companies supporting secure and usable authentication, and W3C, the World Wide Web Consortium, together make it possible to move from passwords to more secure modern authentication. W3C has published specifications for browsers as a formal recommendation called the WebAuthn protocol. FIDO has published specifications for everything else as the Client to Authenticator Protocol (CTAP). These two protocols together enable the password-less user experience.




To use the WebAuthn protocol, a user must have a client and an authenticator. Clients are browsers or mobile applications. An authenticator is a device that performs the cryptographic operations necessary to implement the WebAuthn protocol. Two core actions performed with an authenticator are registration and authentication. The user experience can then be tailored to each person's unique preferences and constraints while maintaining a level of security exceeding that which passwords can offer. Some users may prefer a PIN, while others may choose a biometric authenticator. Because users can re-use the same device and the same second factor across all relying parties, this technique is more scalable as compared to passwords.

However, each time a user upgrades a device, for each relying party where they have registered an old authenticator, the user will need to log in, delete the old authenticator and register a new one manually. Additionally, if they lose their registered device, then the WebAuthn scheme makes it difficult to recover account access. The solution to this is the Pre-emptively Synced Keys (PSK) Protocol, which uses a backup device.

Conclusion

User certificates allow for the separation of roles unlike passwords, yet, they are still not very common due to lack of convenience. The use of certificate-based authentication is not exactly effortless, since it requires certain technical capability to configure and manage it. To overcome the pitfall of passwords, multi-factor authentication (MFA) is being deployed by many companies, which requires two or more verification factors to grant access. As MFA does the job, companies don't feel the need to upgrade to certificate-based authentication, but only time will tell whether or not that remains the case.



Indian Judiciary and Technology

Shalini Pathak

MSC 1st year

The judiciary is one of the institutions upon which rests the responsibility to maintain the noble edifice of democracy and the rule of law. The judiciary stands as a bulwark against the abuse, misuse or unfair accumulation of power by the executive, and protects citizens against governmental lawlessness. It is one of the three basic pillars of the Indian democracy. The stakeholders in courts are the judges, the litigants, the lawyers, the court staff, the general public and the government.

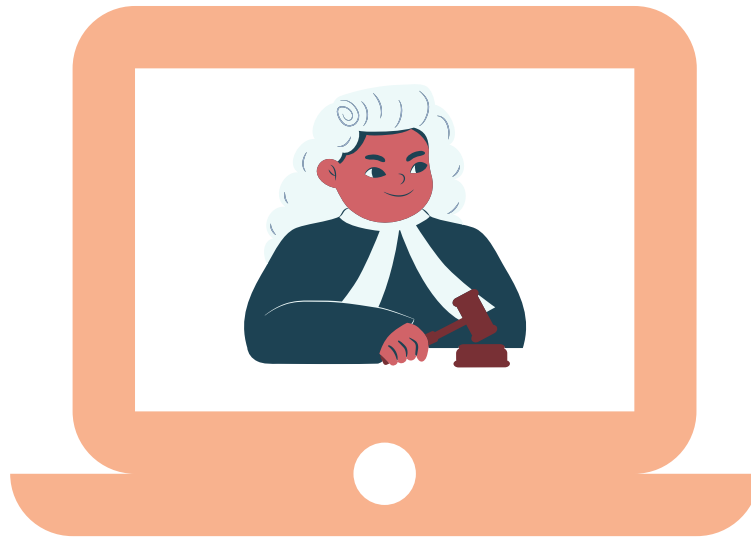
People often have a stereotyped outlook about Indian courts being slow, rigid and secretive. With the help of IT, this perception can be changed and courts can become more efficient, fast and responsible. IT is available for various uses in the Indian judiciary and its allied areas and is already in operation in some courts.

Areas where IT is already in use

- **Video-Conferencing:** The court is connected to the jail by ISDN Lines. At both ends, a camera unit and a display unit, like a 29" TV Screen, is provided, with a recording facility at the court's end. Under-trial is produced at the jail end. The judge, lawyers and witnesses etc. remain present in the court. The judicial remand of the under-trial can also be extended without him being physically present in court. This ensures that dreaded criminals can be tried without any risk, savings can be achieved in the cost of the production of undertrials for remand extension, and multiple trials of an accused lodged in one jail is possible in different states of India.
- **Data Management:** Data can be captured at the filing stage for the new cases. Data of previous cases are fed in computers using dedicated manpower. This includes the date of filing, a full description of parties, the law provision invoked, property number, the stage of the trial, next date of hearing, advocate's name etc. Data is updated on a daily basis without fail. Thus, the press of a single button can generate cause-lists. Periodical statements can be easily generated and age-wise / category-wise segregation of cases is possible.



- **Digital Signatures:** The data which is to be sent through the internet is encrypted using the digital signature card, which the Service Provider provides. Said data is then sent to the receiver in an encrypted format. The data is then decrypted by the receiver, who uses the verifier software provided by the Service Provider. This means that release warrants can be sent from courts to jails within minutes of passing the order. Also, certified copies can be issued instantly by the copying branch, as soon as the order is digitally signed.
- **Biometric Identification:** Biometric readers are readily available, and can be installed with court computers. Biometric profiles of the accused, sureties, witnesses and other court users are prepared and kept in an online data bank. The biometric reader can identify such a person and their entire history can be retrieved.
- **E-Courts:** Paperless courts with audio-visual presentation and video-conferencing facility allow automatic recording of evidence. They are modelled on the pattern of Court-21 of the USA. For existing files, scanning and OCR software can be used, so immediate retrieval is possible. Visual animations & presentation of arguments is also possible. E-courts have proved to be very effective during the coronavirus lockdown; many pending cases have been heard through this. E-filing is the first step towards E-court. Recently, Justice D.Y. Chandrachud said, "The idea is to show the flexibility of the Indian judicial system. Not for a moment do we want to replace the physical hearing. But we are conscious of the need to



protect the public health of our lawyers, litigants who come to our country or across the country.” The Chief Justice of India, SA Bobde, has said that the Supreme Court has put forward a proposal to introduce a system of artificial intelligence that would facilitate in better administration of justice delivery.

Other ways in which technology can impact the judiciary include AI, which is capable of assisting judges by predicting vital information regarding an ongoing case, based on past cases of a similar nature. Furthermore, as India is a multi-lingual country, speech recognition will help in improving the productivity of the judiciary and corporate legal departments, by supporting tasks such as streamlining documentation efforts. Additionally, blockchain can produce a time-stamped series of records of data, that is immutable and managed by a cluster of computers not owned by any single entity. Managing court judgments, warrants and criminal histories are three record-keeping challenges that blockchain will help in addressing

Conclusion

As long as people do not receive justice timely, there is no significance of “JUSTICE, social, economic and political” mentioned in the preamble. For this, courts must be able to adapt more quickly to changes in laws, demographics and society, by taking advantage of the provisions that technology provides.

Programming Languages On The Verge Of Death

Tania Aggarwal

MCA 1st year

It is generally and very truly said that nothing lasts forever, and programming languages are no exception. No matter how 'cool' or 'hyped' a programming language is, eventually the better ones take over, and the current 'favourite' fades away. Since the beginning of the computational revolution, there have been hundreds of programming languages, of which some have stood the test of time and are still widely used, while others haven't fare that well. They came, ruled and faded away. Among all the various possible reasons for this inevitable decline, one can be attributed to the fact that with time, new generations of developers embrace the languages and frameworks they find easier to work with. Discussed below are few programming languages that are already obsolete, or are likely to be in the coming few years.

Objective-C

Developed by Brad Cox in 1983, Objective-C is a superset of the C programming language and provides object-oriented capabilities and a dynamic runtime. The language follows the Smalltalk-derived syntax and is notable for being the primary language used by Apple for both iOS and macOS. Objective-C continued to be the only language used for developing Apple software until 2014, when Swift arrived. Since then, the preference of Swift over Objective-C by the developers due to its various remarkable features like robustness and better memory management has led Objective-C to find a place in the list of dying programming languages. Having said that, it has been 36 years since Objective-C came around, and the language still has some occupancy in the market. Hence, it will probably take a few more years for Swift to completely take over.

Perl

Perl is a high-level programming language used for a wide range of tasks such as web development, text manipulation, GUI development, network programming, and many more. Originally developed by Larry Wall in 1987, Perl has numerous features that ease the task of a programmer, but it comes at the expense of significant CPU and memory requirements. These factors have resulted in its increasing disuse. The latest sister version of Perl - Perl 6, also known as Raku, was released in December 2015. This release did revive the language somewhat, but by then the advent of several other prominent programming languages, especially Python, had made it difficult for Perl to regain control over the market.



Pascal

Pascal is a general-purpose procedural programming language that was specifically developed for teaching programming practices in a structured manner. Created by Niklaus Wirth, Pascal is a descendent of ALGOL 60. It is named after the French mathematician Blaise Pascal, who invented the first mechanical calculator. It led to the development of Delphi (Object Pascal), which in general can be considered as an object-oriented derivation of Pascal. Because of its various features like easy-to-learn syntax, extensive error checking and a strongly typed system, Pascal used to be a fairly popular and in-demand language. But Delphi soon took its place, condemning it to the list of dead programming languages. However, considering its growth and demand in the current scenario, Delphi itself is on the verge of vanishing now.

Haskell

.Haskell is a general-purpose language supporting features like static typing, functional programming, type inference and lazy evaluation. Designed for handling symbolic computations and list processing applications, it has held more relevance in the research and industrial application domain. It also supports various features such as better reliability, shorter lead times etc, which has earned it preference in several big-tech companies like Facebook, GitHub and IBM in the past. However, the TIOBE popularity index shows a consistent decline in its demand and usage in the past 8-10 years. This decline could be attributed to various factors like difficulty to learn, static typing and so on. These factors have made its demise imminent.

VB.NET

Visual Basic .NET (VB.NET), as the name suggests, is implemented on the .NET Framework. Visual Basic was developed by Microsoft as a variant of BASIC, and VB.NET was launched in 2002 as the successor to Visual Basic. It is a multi-paradigm, object-oriented programming language. It has enjoyed its fair share of popularity for a long time, but the latest TIOBE Index reports show that VB.NET is now losing out to competitors like C#, which is taking over in terms of demand and popularity. Yet, due to its strong hold over the programming world in the past, VB.NET still has adequate occupancy in the market and will probably take years to die out.



In conclusion, there is nothing wrong with programming languages, that makes them disappear. It's just that with evolving technology, developers find alternatives to catch up with trends. The truth is that programming languages seldom really die, they just become outdated. A developer's responsibility is to analyze trends, understand the demands of the tech market and know the current and future scope of languages in the IT world, and adapt accordingly.

MAZON ALEXA SCANDAL

A Reality Check on the Virtual Personal Assistants Market

Nikita Jangid

MSC 1st year

Many of us have heard the phrase 'Hey Siri' or 'Okay Google', be it via advertisements or on our mobile phones, seldom paying attention to these features, which help us with simple tasks on our mobile devices. These are called

Virtual Personal Assistants (VPAs), or simply virtual assistants. As the name suggests, these are personal assistants within our phones, that help us with tasks such as setting the alarm, doing calculations or performing a quick search. Not only phones but these assistants are also being deployed in smart home devices and smart speakers. Smart home devices are being used to monitor and control lighting, heating and security systems, thereby creating a home automation system. Some commonly known virtual assistants include Siri by Apple, Google Assistant by Google, Alexa by Amazon, Cortana by Microsoft, Blackberry Assistant by Blackberry and Bixby by Samsung. VPA is a computer program that uses artificial intelligence and helps start a conversation with humans through auditory or textual methods. To achieve human-like interaction, it includes many technologies like machine learning, natural language processing, cognitive computing, speech recognition and handwriting recognition.

Virtual personal assistants deployed in smart devices are continuously switched on, since they monitor conversations for voice commands. With such home devices monitoring different home activities, they have enormous power to access one's daily household conversations, which may include private and sensitive information. This may lead to privacy breach and information leakage. One such incident took place in the house of a family residing in the United States of America, and the incident is now famously referred to as the Alexa Scandal.

AMAZON ALEXA SCANDAL

A couple in Portland, Oregon received a nightmarish phone call about their Echo devices getting hacked. One of the Amazon Inc. Alexa-powered Echo devices in their home had covertly sent recordings to the caller without the couple's permission. The caller, who

happened to be an employee of the husband, was on the couple's contact list. The couple had Amazon's voice-activated devices throughout their home, to control the heating, lights and the security system.



Amazon's Explanation

An Amazon spokesperson was quoted, saying, "Amazon takes privacy very seriously. We investigated what happened and determined that this was an extremely rare occurrence. We are taking steps to avoid this from happening in the future" and gave the following explanation: "Echo woke up due to a word in the background conversation sounding like Alexa. Then, the subsequent conversation got recorded as a send message request. At which point, Alexa said out loud, 'To whom?', and the background conversation got interpreted as a name in the customer's contact list. Alexa then asked out loud, [contact name], right? Alexa then interpreted the background conversation as 'right'. As unlikely as this string of events is, we are evaluating options to make this case even less likely."

Thus, VPAs can be helpful to us, but at the same time, there are problems related to them that make us think about whether they are reliable or not. Whenever one uses the services of a VPA, they might be passing along confidential information and records, which potentially exposes one's details such as contact list, names or location, and people are unaware of the data being stored or deleted. Many cases of information getting leaked from online databases have been witnessed in the past, that pose serious security threats. Virtual helpers like Siri and Cortana are helpful but do not always keep our questions private. As these assistants require an internet connection to function, the risk multiplies if they have access to passwords and sensitive information from other apps linked to them.

Virtual assistants may be the new trend and are helpful, but data security, privacy breach, lack of reliability, limited responses and a high price highlight the negative aspects of such assistants, which are hard to ignore. They cannot replace tasks done manually by humans and are unreliable in their functioning and responses. Privacy and data security are sensitive areas about which most people are unaware and uninformed. Security threats and data phishing might take place by continuously using such devices. All these negative aspects have consequences in the real world, and thus VPAs must be used with caution.

General Data Protection Regulation

Prashant, Anjali Singh

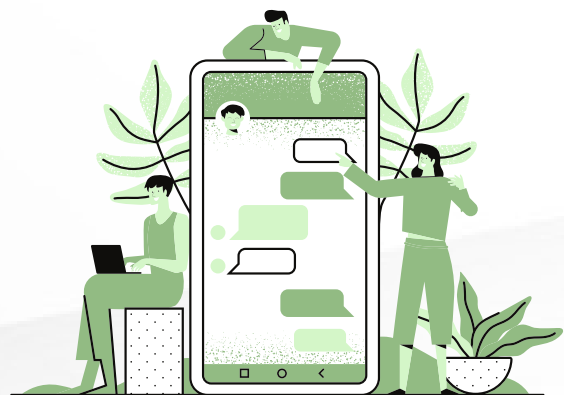
MCA 1st year

The General Data Protection Regulation, or GDPR, is a law enforced by the European Parliament in the European Union (EU) and the European Economic Area (EEA), that allows owners to have full control of their data, by assigning obligations to service providers who manage and process personal data. First implemented on 25 May 2018, the law simplifies the regulatory environment for international business by unifying the regulation within the EU.

The provisions are consistent across all 28 European Union member states and as per the law, the companies have just one standard to meet within the European Union to protect the personal data and privacy of EU citizens for transactions that occur within the Union. However, that standard is remarkably high and requires most companies to make a considerable investment to meet and to administer.

Personal data includes any information related to a person such as a name, a photo, an email address, bank details, updates on social networking websites, location details, medical information, or a computer IP address; all this data is protected through GDPR. After the implementation of the law, any resident of the EU can demand the following:

- Right to access
- Right to be forgotten
- Right to data portability
- Right to be informed
- Right to have the information corrected
- Right to restrict processing
- Right to object
- Right to be notified



There are some cases, however, that aren't addressed in the GDPR, specifically those relating to personal or household activities, law enforcement and national security.

A company must be GDPR compliant to avoid the penalties attached to it. Companies appoint a data collector, a data protection officer and a data processor, who manage the

collection, storage, and distribution of the data and are also responsible for compliance. The data protection officer or data controller is in charge of GDPR compliance. Data processors maintain and process personal data records. In case of a breach or non-compliance, the processors are held liable. They are also responsible for the security measures taken to avoid piracy .

Penalties for those companies and organizations who don't comply with GDPR amount to fines of up to 4% of annual global revenue, or 20 million euros, whichever is greater. To comply with GDPR, an organization must:

- Map the company's data
- Determine what data should be kept
- Put security measures in place
- Review the documentation
- Establish procedures for handling personal data

Equal liability is placed on the data controllers and data processors under these guidelines. Responsibilities need to be clearly mentioned in all existing contracts with the customers and the processors (for example, cloud providers, Software as a service (SaaS) vendors, or payroll service providers). Any freely given specific, informed, unambiguous and clear affirmative action by which a person permits for their data to be processed in a particular way, should be asked before accessing the data.

India has also followed the European Union's footsteps, allowing global digital companies to conduct business under certain conditions, instead of following the

isolationist method of Chinese regulation, that does not allow global digital companies like Google and Facebook from operating within its borders. According to recent reports, the Indian government looks set to legislate a Personal Data Protection Bill (PDP Bill), which would control the collection, processing, storage, usage, transfer, protection, and disclosure of personal data of Indian residents. The PDP Bill carries additional provisions beyond the EU regulation. Several features of the PDP Bill will require companies to change their business models, practices and principles. Many others will add operational costs and complexity.

Data is extremely valuable in this new world. And while GDPR does create challenges and pain for businesses, it also creates opportunity. When the regulation was first announced in 2016, it seemed like plenty of time was there for businesses to take the necessary steps to comply with the rules. But before they knew it, time went by and many companies are still disorganized, long after the deadline has passed. Companies that continually show their concern about an individual's privacy (beyond mere legal compliance), which are transparent about how the data is used, and which design and implement new and improved ways of managing customer data will always retain loyal customers and build deeper trust.

Technology Addiction & Detoxification

Shubham Sharma
MCA 1st year

Technology spans a spread over a number of devices and platforms. From mobile phones, tablets, and video game consoles to social media. It is worth addressing how each of these listed items can slowly become an obsession.

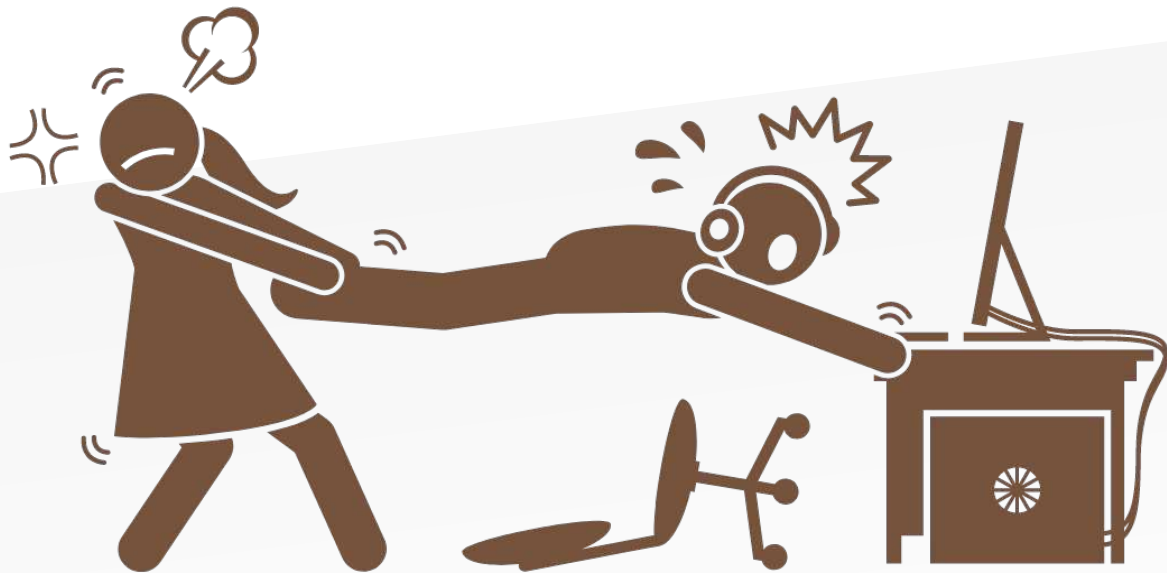
Every obsession or addiction, from an obsession with gambling and drugs to video games and technology, are based on the same fundamental dynamic: the brain's expectation that engaging in a specific activity will provide a reward. This reward may or may not be obvious to the tech addict. In fact, it's sometimes counterintuitive since it poses a potential harm for the user. But our mind still takes it as a positive experience.

Smartphones, Tablets, Computers, The Internet, Video Games, Social Media, YouTube and few more can be termed as DRUGS for the technology addict. So here are a few signs that hints that you have addiction of Technology :

- You reach for your phone instinctively whenever it buzzes or rings
- If you don't check your phone after receiving an alert, you become anxious

- You experience symptoms of withdrawal if you can't go online
- You're routinely failing to meet your commitments or are habitually late because of technology
- When you check social media, you feel euphoric
- You often take your smartphone to the bathroom with you
- You are ready to sacrifice sleep to spend more time online
- Now you do not participate in activities that you once enjoyed in the past
- Your social skills have jailed to the point that you are uncomfortable around others

As we know addiction has many consequences. These consequences may range from psychological to physical. Depending on their severity and nature, they can make life worse or less enjoyable. It's worth underscoring that technology has the ability to improve our lives in many ways. It can boost our effectiveness and increase our productivity at everything we do. But it's only a tool. And like any other tool, it can



wreak havoc if used poorly or thoughtlessly. The following are some of the most common side effects seen in Tech Addicts. Individually, these side effects may seem harmless but collectively, they show that continued overindulgence with technology can produce drastic unwanted results.

- Increased Stress
- Inability To Concentrate
- Inconsistent Sleep Quality
- Decline In Social Life
- Vision Problems
- Back And Neck Pain
- Weight Gain
- Depression
- Lack Of Impulse Control
- Frequent Procrastination

So we have seen the symptoms and side effects of technology addiction. Now let us see how to detox this addiction or how can we minimize this addiction.

There are some ways to treat this addiction. One way is rehab. This approach works in the same way as alcohol or drug rehab. You visit a treatment center for a particular period of time - for example, a few weeks - during which your access to technology is restricted. Some clinics also offer outpatient programs, but as with outpatient alcohol or drug and rehab, there is a high rate of relapse.

The second approach is self-treatment. Instead of visiting any therapist or enrolling yourself into a rehab facility, you take the control in breaking your addiction. You're in control. Here, we are talking about practicing a personal digital detox. The advantages of self-treatment are twofold. First, it's less expensive than therapy or paying a rehab facility. Second, it causes less disruption to our present lifestyle. If you think the same, those two advantages are enough to seal the deal.

Digital Detox:

A digital detox may involve ignoring or stepping away from all of your gadgets. This may include your smartphone, tablet, and laptop. There are many challenges to traveling this path. For example, you may find it impossible if your job requires you to use a computer. Also, how can you keep in touch with people without phone calls, texts, and emails?



And what about withdrawal symptoms? A digital detox is like a drug detox. Your brain craves for the dopamine rush that results from your compulsiveness. Once you have cut off or limited your access to technology, you will feel the pangs of withdrawal.

One important thing that you should remember is that breaking your addiction requires the removal of your smartphone and other tech tools. You also need to sever the connection, at least temporarily. Think of it this way: if you were addicted to cocaine, you wouldn't try to break your

addiction requires the removal of your smartphone and other tech tools. You also need to sever the connection, at least temporarily.

Think of it this way: if you were addicted to cocaine, you wouldn't try to break your addiction by gradually reducing the number of lines you do each night. That strategy is guaranteed to fail. Rather, you'd check yourself into a clinic and undergo a complete detox, one with no access to cocaine.

That's how you need to approach your addiction to technology. If you want to break the habit, regain control of your focus and productivity and stop feeling overwhelmed, you need to do a complete digital detox. You will probably need motivation for this detox. It is recommended for you to write down, in a list, as many ways your life will improve after you break your technology addiction. Review this list whenever you experience signs of withdrawal.

Hope this may help you get wealthier health.

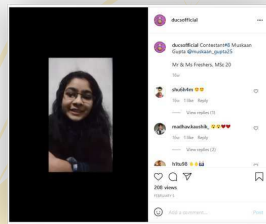
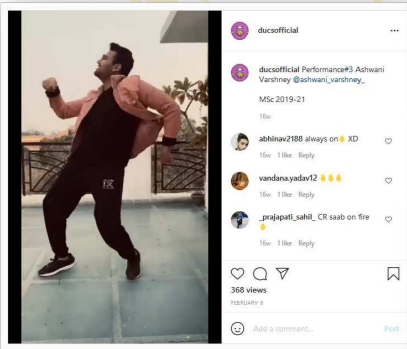
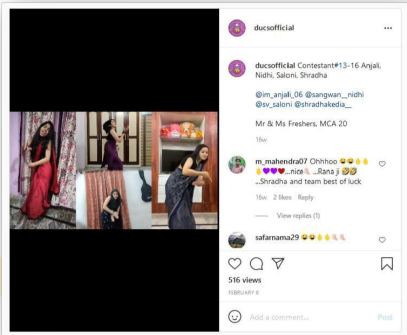


LIFE @ DUCS



Parichay '21

THE VIRTUAL FRESHERS



Miss Freshers (MSc)



Kavita

#STAYHOME

Mr. Facify



Rishabh Singh

#STAYHOME

Miss Freshers (MCA)



Anjali

#STAYHOME

Mr. Freshers (MSc)



Madhav Kaushik

#STAYHOME

Miss Facify



Riya Swami

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Mr. Freshers (MCA)



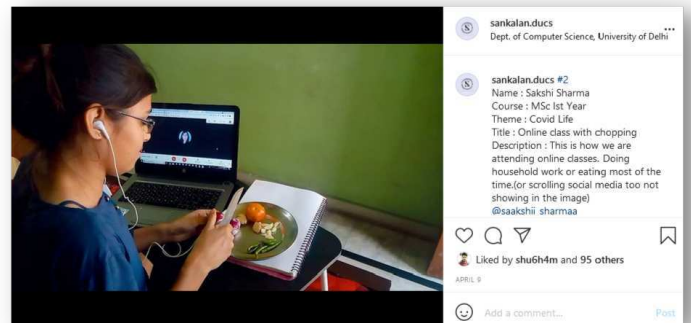
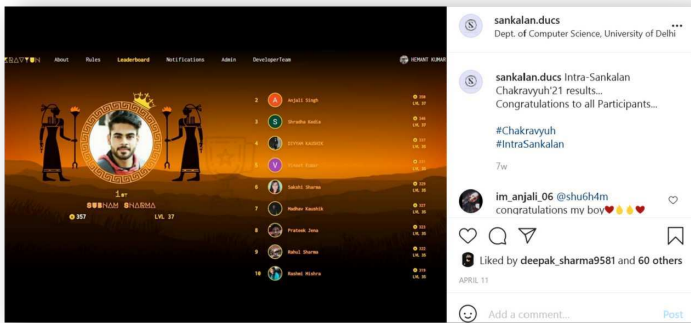
Nimish Naliwal

#STAYHOME

Sankalan

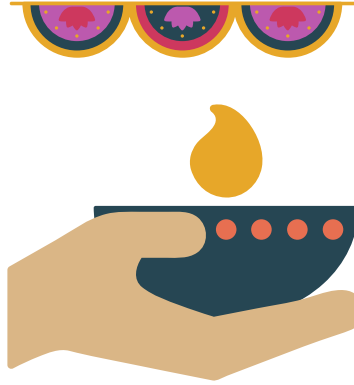
THE VIRTUAL TECH FEST

This is the annual tech fest of DUCS which has been our pride for more than a decade now. Since its inception in 2005, it has been a part & parcel of lives at DUCS. Students from universities across India come and participate enthusiastically in this two day event. This is the time when everyone works together as a team and is dedicated towards a common goal to bring pride and honour to the Department. 'Division of labour' is followed here at every step. This keeps the students mentally prepared to perform well in the companies and prepares them to take responsibilities and live up to the expectations. Renowned people from the IT industry and our alumni placed in various tech giant companies judge and review all the technical events held during the fest. After the two days of long grilling experience, students are awarded and appreciated for winning and participating in the fest. A large number of sponsors who financially aid this event form the backbone of the fest.



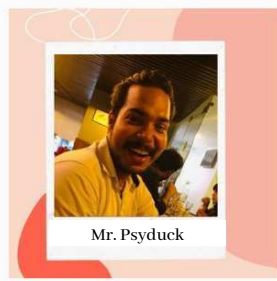
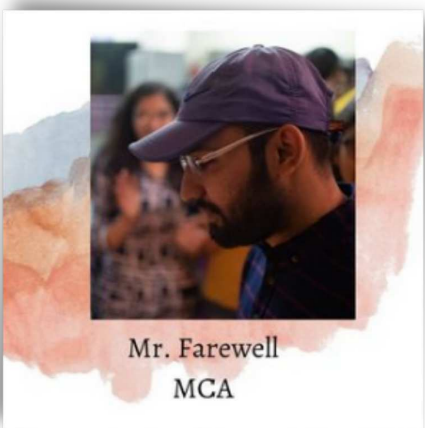
Diwali Night

AND THE SKIT



Sayonara '20

The Virtual Farewell



CORONA RESULTED IN MAKING OUR LAST TOAST TO THE SENIORS OF BATCH DUCS'20 VIA VIRTUAL MEANS.

- **Social Media and Human Psychology:** [image0](#)
- **Olfactory Technology:** [image0](#)
- **Myths of BERT:** [image0](#), [image1](#)
- **3D Bio-printing:** [source0](#), [image0](#)
- **Exploration of Celestial Bodies and AI:** [source0](#), [image0](#)
- **You version your Code, why not Database:** [image0](#)
- **Digital Surveillance:** [image0](#), [image1](#)
- **Container and Container Orchestration:** [source0](#), [source1](#), [image0](#), [image1](#)
- **Bias in AI systems:** [source0](#), [source1](#), [image0](#)
- **Computer-Aided Education:** [source0](#), [image0](#)
- **Passwords, Authenticators and Asymmetric Cryptography:** [image0](#), [image1](#)
- **Indian Judiciary and Technology:** [source0](#), [source1](#), [source2](#), [image0](#)
- **Programming Languages On The Verge Of Death:** [image1](#)
- **Amazon Alexa Scandal:** [source0](#), [source1](#), [source2](#), [source3](#), [image0](#)
- **General Data Protection Regulation:** [source0](#), [source1](#)
- **Technology Addiction and Detoxification:** [image0](#), [image1](#)

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UNIVERSITY OF DELHI

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2021