

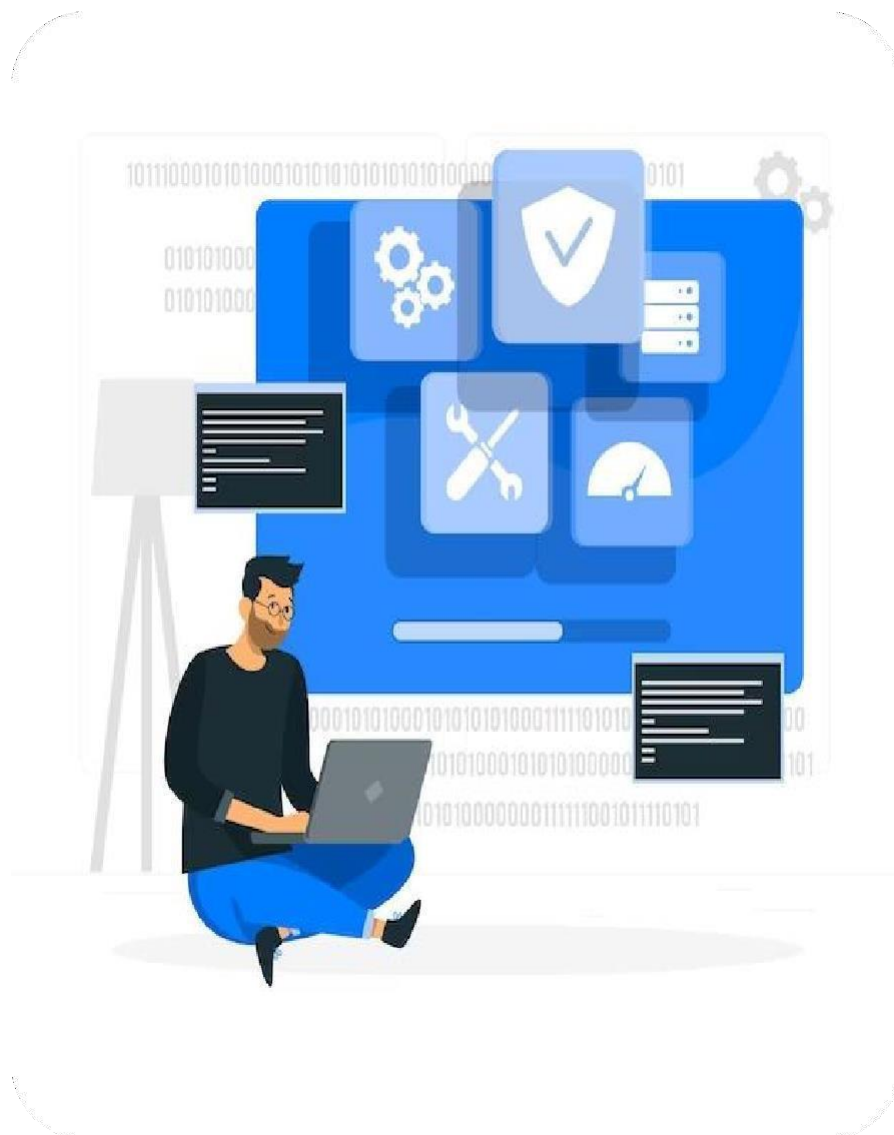
'BOOT OF COMPUTER'

Best of Outstanding Technology

Department of Computer Science & Engineering Institute of
Engineering and Science

IPS Academy, Indore

2021-22





CSE Department Information

Name and address of the department:

Department of Computer Science & Engineering

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Knowledge Village

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PRINCIPAL MESSAGE



Technical Education is the most potential instrument for socio-economic change. Presently, the engineer is seen as a high-tech player in the global market. Distinct separation is visible in our education between concepts and applications. Most areas of technology now change so rapidly that there is a need for professional institutes to update the knowledge and competence.

Institute of Engineering and Science, IPS Academy is a leading, premium institution devoted to imparting quality engineering education since 1999. The sustained growth with constant academic brilliance achieved by IES is due to a greater commitment from management, dynamic leadership of the president, academically distinctive and experienced faculty, disciplined students and service oriented supporting staff.

The Institute is playing a key role in creating an ambiance for the creation of novel ideas, knowledge, and graduates who will be the leaders of tomorrow. The Institute is convinced that in order to achieve this objective, we will need to pursue a strategy that fosters creativity, supports interdisciplinary research and education. This will also provide the students with an understanding and appreciation not only of the process of knowledge creation, but also of the process by which technology and knowledge may be used to create wealth as well as achieve social economic goals.

I am delighted to note that the engineering graduates of this institute have been able to demonstrate their capable identities in different spheres of life and occupied prestigious positions within the country and abroad. The excellence of any institute is a measure of achievements made by the students and faculty.

All the Best.

Dr. Archana Keerti Chowdhary
Principal

HOD MESSAGE



Today we find that information technology has become overwhelmingly pervasive, while its parent, computing science, has become correspondingly hard to find. While many CS educational institutions have shifted focus from core CS. This is the single most important attribute of the education offered here. Our department has remained true to the vision on which it was founded. There are several ways to present the canonical core of computer science. Over the years we have developed a distinct style and method that bridges the theory - practice divide while remaining grounded in the core. Technology changes rapidly, especially in the field of computing, whereas the science, if it changes at all, does so much more gradually. Our understanding is that persons who are clear and thorough about the fundamentals can adapt to rapid changes in technology relatively easily. We want the education imparted to our students to be the basis of a life time of learning. Our Department has produced hundreds of professionals and has established a name for itself in the country and abroad. They have consistently excelled in the highly competitive industrial environment, Best Employer/ awards in top-ranking companies. I attribute this success to the winning combination of a dedicated faculty that works hard at imparting quality education, a well-planned syllabus and last but not the least, our students. Learning is a continuous process and does not end with the acquisition of a degree, especially because steady and rapid advances in computing technologies shorten the life of tools and techniques prevalent today. Therefore we do not aim to make our students walking manuals of any language or package. Instead, they are given a strong foundation in computer science and problem-solving techniques and are made adaptable to changes. We believe that this approach to teaching-learning, coupled with practical experience gained during Industrial Training in reputed organizations, equips our students to handle the challenges posed by the software industry.

Dr. Namrata Tapaswi
HOD, Computer Science Engineering
IPS Academy, Institute of Engineering & Science

Vision & Mission of the Department

Vision

Attaining global recognition in computer science and engineering education, research and training to meet the growing needs of the industry and society

Mission

Provide quality undergraduate and postgraduate education, in both the theoretical and applied foundations of computer science, and train students to effectively apply this education to solve real-world problems, thus amplifying their potential for lifelong high-quality careers.

Programme Education Objectives

The educational objectives of the Computer Science & Engineering programs are as follows:

1. To prepare students for successful careers in software industry that meet the needs of Indian and multinational companies.
2. To develop the skills among students to analyze real world problem & implement with computer engineering solution and in multidisciplinary projects.
3. To provide students with solid foundation in mathematical, scientific and engineering fundamentals to solve engineering problems and required also to pursue higherstudies.
4. To develop the ability to work with the core competence of computer science & engineering i.e. software engineering, hardware structure & networking concepts so that one can find feasible solution to real world problems
5. To insemenate in student's professional and ethical attitude, effective communication skills, team work skills, multidisciplinary approach, and an ability to relate engineering issues to broader social context.
6. To motivate students perseverance for lifelong learning and to introduce them to professional ethics and codes of professional practice

Programme Outcomes

An engineering program defines a set of specific program outcomes that relate to its educational objectives, including the items a-k listed below. We regularly review the courses in our curriculum to make sure that all these items are covered, and try to measure whether our students are successfully attaining the following goals:

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3.Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change


History Of Department

The Department of Computer Science & Engineering was established in the year 1999 offering Bachelor of Engineering (BE) with intake 60, it was increased to 120 in year 2012 and again intake was increased to 180 in year 2014. The programme is intended to educate students on the applications of scientific knowledge for practical purposes involving activities like modeling, analysis, design and other associated fields of core courses in Computer Science & Engineering education. It intends to equip graduates with profound theoretical knowledge and rich hands on experience.

Department Faculty Details

			
Dr. Namrata Tapaswi Professor	Dr. Neeraj Shrivastava Associate Professor	Dr. Nitin Jain Associate Professor	Dr. Dharmendra Yadav Associate Professor
			
Dr. Pratik Gite Associate Professor	Dr. Vaishali Gupta Assistant Professor	Dr. Prateek Nahar Assistant Professor	Dr. Dharmendra Choukse Assistant Professor
			
Mr. Arvind Updhyay Assistant Professor	Ms. Nisha Bhalse Assistant Professor	Mr. Deepak Shukla Assistant Professor	Ms. Angita Hirwe Assistant Professor

			
<p>Mr. Sourabh Jain Assistant Professor</p>	<p>Mr. Ved Kumar Gupta Assistant Professor</p>	<p>Ms. Barkha Sahu Assistant Professor</p>	<p>Mr. Pratik Jain Assistant Professor</p>
			
<p>Ms. Anjali Verma Assistant Professor</p>	<p>Mr. Yagyapal Yadav Assistant Professor</p>	<p>Mr. Vijay Choudhary Assistant Professor</p>	<p>Mr. Indra Kumar Shah Assistant Professor</p>
			
<p>Mr. Sunil Nimawat Assistant Professor</p>	<p>Ms. Nitu Mathuriya Assistant Professor</p>	<p>Mr. Pankaj Pateriya Assistant Professor</p>	<p>Ms. Priyanka Vijayvergiya Assistant Professor</p>

			
Mr. Sumit Devray Assistant Professor	Ms. Neha Yadav Assistant Professor	Mr. Vishal Chhabra Assistant Professor	Mr. Ashish Sharma Assistant Professor
			
Ms. Shefali Aggrwal Assistant Professor	Mr. Somil Neema Assistant Professor	Ms. Arpita Bhatia Assistant Professor	Ms. Poonam Mishra Assistant Professor
			
Ms. Vasudha Sharma Assistant Professor	Ms. Ritumbara Chauhan Assistant Professor	Mr. Yash Parashar Assistant Professor	Ms. Pooja Kothari Assistant Professor

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Bridging the Digital Gap: Project Loon

Aficionado. Don't know what it means? Google it. Not sure how to reach there? Use the GPS. In search of a new restaurant? Need content for your project? In need to get in touch with your friends? Book an online appointment, shop online just be Online. Isn't Internet the one and only answer to all these questions? Exactly! With me the concept of basic necessities of life hovering over food, shelter and clothing has expanded to food, shelter, clothing and internet. Digital divide used to be the small gap between regions that have access to modern technology, and those that don't or have restricted access. But don't we see the gap enlarging? According to recent statistics only 40% of the population on earth enjoys internet facilities and about 60% of them are deprived of this all new fourth necessity of life. Balloons in the sky providing you with Internet connection right wherever and whenever you need it. Not too hard to imagine, is it? This is real! Project Loon by Google X serves as a prime solution to all your problems. The project uses high-altitude balloons placed in the stratosphere at an altitude of about 32 km to create an aerial wireless network with up to 3G-like speeds. The idea itself sounded so crazy that the makers of this device from google decided to give it an unusual name. Wind data from the National Oceanic and Atmospheric Administration (NOAA) is collected and analyzed to maneuver the balloons by adjusting their altitude to float to a wind layer with the desired speed and direction. The signals travel through the balloon network from one balloon to another and further to the ground-base station which is connected to an Internet service provider. Further these signals are shot onto the global internet thereby engendering a way to serve remote and rural areas poorly served by existing provisions with the gift of internet. One of the most obvious avails of the project is the Availability of Information. Assuming all the mechanisms of the project are functioning as planned, every single person who has access to some device that has Wi-Fi access would be able to search for almost any form of media online. Information will be accessible to everyone irrespective of their location also in case of natural disasters when all the sources of information about that area are destroyed, project loon will serve as the only blessing. The main problem with launching any hardware project is the certainty of eventual hardware failure. In most cases, the hardware is usually accessible and can be fixed. Loon balloon fails, it can either remain up in the air floating, making it difficult to bring down or Smartphones are gone from single-core to nowadays Octa-core. An SoC is an integrated circuit that integrates all components of electronic system into a single chip. It might go down in unwanted areas. Both of these scenarios are a huge concern to the stability as well as the safety of people. Their lives might be affected by unwanted balloon landings. Another concern over this project is internet privacy since it gives Google more power over a wider range of consumer behavior. This information can become a security issue if it is shared with Government agencies. This project is being currently tested in various parts of the world and if we keep our fingers crossed soon the entire world will be blessed with the internet facility because of Google's Project Loon.

Dennis MacAlister Ritchie – The unsung hero

During the month of October in the year 2011 a luminary died, though his bequest will live on and inspire people, the very end of this world. Even though he was not a soldier, but yet was a true hero. His work gave direction to the future of technology and considering our dependency on it, the future of the complete race. His benefication in the form of his inventions led to some of the most famous technological paragons of our times. I'm sure none of us have been eluded from the mania that was created in the form of iPhone, iOS and Mac OS X. But he was human at the end. The legend failed his battle with prostate cancer and ultimately, death. Posterity will always remember him as the father of modern computing. This man was an iceberg that hid from the common people, but the roots of whose work tap into the very depths of the technical universe. I am writing about an unsung hero - Dennis MacAlister Ritchie. Surprised? I'm sure 99 percent of all people who read will be. Dennis M. Ritchie, Dennis Ritchie or simply 'DMR' as he was affectionately called by his workmates, was the deviser of the C programming language and the co-composer of the symphony that the UNIX operating system is. He died a week before Steve Jobs, with an affront void of media coverage. The list of devices, software, applications and services which run on the so called simplistic 'low level' language which he created and the operating system which he helped build and so here is an image to name a few: Ritchie joined Bell Labs in 1967 and the rest, as they say, is History. For his unparalleled offerings in the field of technology he was awarded Posterity will always remember him as the father of modern computing. The C programming language today has its own family of languages which encompass C++, C# and even JAVA! Together they subjugate a colossal 60% market share of the software industry in the world. Every major player in today's computer market thrives on what DMR created. The trailblazer did not believe in acquiring stardom or accumulating substantial riches. The UNIX operating system that he developed was open source and given to universities and anyone who would ask, so that people could assimilate and evolve his vision further. He helped port UNIX to different machines and platforms which now exist in the likes of HP-UX, IBM AIX and Oracle Solaris. Apart from these the Mac OS X, Linux, Android and iOS and even MS-DOS are also UNIX derivatives and fall under the category of 'UNIX like' or 'UNIX based' operating systems. Just like the stones of the Ram Setu float with the very name of Shri Ram, every fibre of Internet vibrates with the name of DMR, as does every PC, MAC, smartphone and tablet. During the last years of his life, DMR battled with prostate cancer and heart disease. He was a bachelor all his life and on 12th October 2011, was found dead in his New Jersey home where he lived alone. He was 70 years old. Had he been given a chance to write his last computer program, I am sure it would have been this. I do not undermine or in any way wish to underplay the contributions made by Steve Jobs. But, if Jobs is a luminary in the computer world, then Dennis MacAlister Ritchie is its God. I'm not saying take any praise away from Steve Jobs in any way, but give some credit where credit is due!

BITCOINS

Can money be imaginary? Well the answer is BITCOINS. BITCOINS are the virtual currency which can be used for day to day transaction over the internet and as a substitute for physical currency. It was invented by Satoshi Natamoko in 2008. However, it remains a mystery who Satoshi Natamoko really is, talking about BITCOINS, it is best described as the first decentralized virtual currency. As it is a currency growing over the internet no government or IMF has the power to control or shun it. As long as the user mines BITCOINS the currency grows. How does it work? BITCOINS use block chains to store the transactions. The storage consists of time, date, participants and amount of every transaction. Each node (connection point) owns a full copy of the block chain. Each transaction is verified by BITCOINS miners on the basis of complex mathematical algorithms. The mathematical algorithms also make sure that each node agrees with the current state of the ledger and transactions in it, if anyone tries to corrupt the transactions, nodes will refuse to incorporate the transactions in the block chain. The public and private key. Basically when you send BITCOINS to your friend every node which receives the message will update their copy of the ledger and then pass along the transaction message but the authenticity of message is checked with digital signature i.e, a password. The private key is used to create the signature. You can look at it as the private key being the true password and signature that proves that you have a password. Public keys are address, compare it to email address i.e, it is to be shared by the sender or receiver for public and private keys you need to have a wallet. Just like a wallet for physical currency wallet can hold your public and private keys, transactions, BITCOIN etc. Talking about wallets you get a variety of them cold wallets refers to offline wallet and is more secure as compared to hot (online) wallets. Wait a minute there are also physical wallets called as paper wallets you can store these wallets in a safety deposit box along with other valuable. BITCOINS mining is like a colossal lottery where you compete with your mining, hardware with tons of people on the net. The faster the hardware, the faster the number of tries per second more the chances of winning.

33 What is Bitcoin Mining? This is the most important part of BITCOIN Mining make BITCOINS network secure as well as generating bitcoins. Now let's go technical, bitcoins mining, hardware uses Hashcash proof of work function. Proof of work is a method to ensure that information was difficult to be made. The proof of work is also designed to depend on previous blocks to force a chronological order in block chain. This makes it exponentially difficult to reverse previous transactions because it will require recalculating proof of works of all blocks. Secondly, for new transactions miners need to include a block with mathematically proof of work, such proofs are hard to generate and depend upon hardware speed for calculations. Also, each block needs to be discovered in ten minutes, making it quite a difficult task.

FACTS

- Number of Bitcoins are finite, which account to 21 million bitcoins
- BITCOIN value keeps on fluctuating every second
- The highest 1 bitcoin reached was in November 13 i.e. 1000 dollars.
- Germany is the only country who has given the official stamp of approval to bitcoins as private money.
- Currently 1 bitcoin = 296.5\$ = 18000rs
- The one and the only bitcoin ATM is in Vancouver.

Artificial Intelligence: Neural networks

The idea behind J.A.R.V.I.S. in Iron Man 3 'Somatosensory Cortex', as the name implies, is responsible for feeling sensations in our body after a physical contact. In another experiment, the Neuroscientists removed the connection between hand and Somatosensory Cortex and connected it with eyes. It was observed the same piece of brain tissue was able to process vision which means it was able to see. There are many more experiments carried out by the Neuroscientists which suggest that the same part of brain tissue can process different information. This proves our assumption that the brain, using only one algorithm can do all the complicated tasks that we do daily (like how you are learning by reading this article). Now, let us come to the part which shows how a machine can mimic a human brain. This is the key idea behind neural network.

Q1. Now what is a neural network? A neural network is a simulation of the algorithm, that the brain uses to process any kind of data. It has an input layer, one or more hidden layers and an output layer. In machine learning and deep learning problems, a neural network is one of the most widely used algorithms which is used to process data that helps a machine learn different things (like a human brain) without being programmed explicitly. This is how YouTube recommends your videos. As time passes, it learns to recognize the type of videos you watch regularly. The same network can process any kind of data. Let me share a more intuitive example of neural networks which can give you a better insight on neural networks. Engineers use a neuroevolution algorithm called NEAT (NeuroEvolution of Augmenting Technologies) to evolve networks that convert either sonar, laser rangefinder, or CCD camera input into a warning signal. How is this done? Well, it is not as complicated as it seems to be in the first place. The CCD camera's image (screenshot of the video taken in every second) is sent as an input to the Neural Network every second. Then the network uses linear algebra to compute the hidden layer (which you can see in the above network architecture). Then the network again uses linear algebra to compute the output layer which is the warning signal if an accident is about to occur. The red lines in the image show that vehicle is on track whereas green lines show an accident is about to occur. The warning signal is then provided to the driver, with the goal of helping them avoid dangerous situations. Here (on the left) are some examples of different sensor modalities that are used in both simulation and on a small four-wheeled robot. The linear algebra used is pretty simple which you can easily check out on the internet. The more the number of units in the hidden layer, the better (and much more efficient) is your neural network. This is just a simple example that uses neural network. There are more complicated problems in the world like the autopilot system, autonomous cars, speech recognition (Siri on iPhone), pattern recognition in codes, numbers, mathematical functions, handwriting recognition, etc. which use neural networks. There are unimaginable applications of it even in the field of astrophysics as some of the astronomers use it to find structure in planetary systems like stars, asteroids, Milky Way etc. An example of this is on the left. Obviously, there is much more to neural networks as we have only seen a simple idea behind it. It is predicted by a bunch of deep learning scientists that this could be the key to someday creating truly intelligent systems like J.A.R.V.I.S, which is smarter than us, can process any form of data by watching us, hearing us, learning from our behavior and interacting with us like just another human.

Payment without Cash

Imagine shopping without cash, it seems to be contradictory, but now not only you can think about it, but also experience it. "UNIFIED PAYMENT INFRASTRUCTURE". In this concept firstly along with the basic details provide your mobile no. and aadhar card no. to the bank in which you have an account. Now an applicaon will be developed which will have the e-up with the bank. The app needs to be installed in the mobile of the cashier of the place you have visited, and in your mobile too. Now, while billing, cashier will add all the products purchased, total it and then ask for your phone no. that you have registered in the bank. Aer entering the no., that whole bill will sent to the mobile phone whose no. was entered and the customer can now check the bill, verify the amount and press 'OK' twice (reconfirmaon) for the final payment. VERIFICATION OF PRODUCT LIST BY CUSTOMER While receiving the message, the locaon of the shop, mall, etc. will be reflected on the receiver's end for the idenficaon. Aer receiving the bill the customer will press "OK" for the payment transaction. BILL RECEIVED BY THE CUSTOMER This will deduct the bill amount from our bank account and adding to the cashier's account, further deleng the number from the mobile of the cashier for avoiding its misuse. TRANSFER OF MONEY Why GPS?, if we don't have bank balance, then we can enter our parents or friends no. on the cashier's mobile phone along with our name and number succeeding the payment and through the locaon of the cashier and our details, parent or friend can know that who has done the payment to whom. Imagine shopping without cash, it seems to be contradictory, but now not only you can think about it, but also experience it. 37

DIAGRAMMATICALLY THE PAYMENT PROCESS BY THIRD PARTY IS SHOWN ON THE NEXT PAGE: 1. No Money 2. Give Parents Number. 3. Message Sending Through GPS 4. Parent recieving the message of shopping Payment done if Parent presses OK

ADVANTAGES: ÿ No need of carrying wallet (i.e. cash, credit/debit cards). ÿ We can shop even we don't have cash, using the cell. no. of parent or friend. ÿ Reducing the chance of misusing ATM PIN, as we are not using credit/debit cards. ÿ All the transaction records will saved in the database.

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Divya Tadge

Computer Programming Goes Back to School

We are witnessing a remarkable comeback of computer programming in schools. In the 1980s, many schools featured Basic, Logo, or Pascal programming, computer labs that students typically visited once a week as an introduction to programming. But, by the mid-1990s, schools had largely turned away from programming. In large part, such decline came from a lack of subject-matter integration and a scarcity of qualified instructors. Yet there was also the question of purpose. With the rise of CD-ROMs over the 1990s, who wanted to toil over syntax typos and debugging problems by creating these applications oneself? This question alone, seemingly negated the need to learn programming in school, compounded by the delirium generated by the Internet. Schools started teaching students how to best surf the web rather than how to dive into it and understand how it actually works. Schools largely forgot about programming, some deeming it entirely unnecessary and others labeling it too difficult to teach and learn. But this is changing. In the past five years, we've seen a new-found interest in bringing back learning and teaching programming at all levels. But it's digitally based youth cultures, not schools, leading this revival (Kafai & Peppler, 2011). What's more, the same computers on which they create these items connect them to wider networks of other young users who share common interests and a similar commitment to connecting through technology. Schools may very well take a page from these informal associations of creative production and networked participation. After all, despite this surge of interconnected youth communities, very few youth are using their smart devices — laptop, iPad, iPhone, or Droid — for something other than the mass consumption of commercial media. These digital natives may be able to technically manipulate the latest devices, but their capacity to wield such devices critically, creatively, and selectively is decidedly less potent. The Internet of Things is mainly concerned with the idea of increased machine-to-machine communication. It is built on the idea of cloud computing and networks of data gathering sensors. 39 What then is the role of programming in helping more productive use of technology? And what is the role of schools in introducing programming to a wider range of youth, particularly given schools' own failed attempts to teach coding in the past? How will schools address challenges of diversity and equity prevalent in computing culture? The definition of computational thinking as designing systems, solving problems, and understanding human behaviors admirably provides quite a broad berth here. Several professional groups like the Computer Science Teachers Association and nonprofits like Shodor have developed academic standards and instructional activities to make computational thinking more accessible for education. Programming has invariably played a role in all proposed curricula. Yet while programming figures prominently, no single programming language is deemed best by all proponents. Whether the language is Java/JavaScript, Python, C/C++, HTML or introductory languages like Scratch and Alice, teaching the underlying concepts conveyed by the language — not the language itself.

Internet of Things

STUDENT THE IDEA When we hear people talk about “the next big thing”, what exactly do they talk about? Is it really innovative thinking? People fail to think big! It's not that they don't imagine, it's that they don't observe. Most of the ideas that turn into big things are around us. The future that you dream is always within sight, and you don't need to imagine what's already there in place. It's time to Think Big! Think Different! The question is HOW?? The solution is 'The buzz surrounding the Internet of Things'. What is the buzz? The Internet of Things is mainly concerned with the idea of increased machine-to-machine communication. It is built on the idea of cloud computing and networks of data gathering sensors. It is mobile, virtual, and instantaneous connection; and it has also been said that it is going to make everything in our lives, whatever we think of, from streetlights to seaports “smart.” Now when we say people don't think big enough we mean they don't think creatively. A lot of gossips and rumors have been heard on machine-to-machine communication (M2M), that means, devices talking to like devices, just like humans talking to each other. But is it really possible? A machine is a tool, an instrument. It is something that is physically doing some activity. It just follows the commands given to it. When we refer to making machines “smart”, we are not exactly referring to machine to machine communication. It has a broader idea. We are talking about sensors! A sensor is a device, not a machine. It does not work in a way as the machine does. It measures and evaluates the data. In short, it gathers data. The Internet of Things comes together with the connection of sensors and machines. The Internet of Things is mainly concerned with the idea of increased machine-to-machine communication. It is built on the idea of cloud computing and networks of data gathering sensors. It comes from creative thinking!! In simple terms, the real value that the Internet of Things creates is a combination of gathering data and taking full advantage of it. The information gathered by all sensors in the world holds worthless if there is no infrastructure to analyze it in real time. The sensors detect the required information correctly. Simply, this concept is basically connecting any devices with an on and off switch to the Internet and also to each other. This will include everything from cell phones, washing machines, coffee makers, headphones, wearable devices, lamps and almost anything and everything else you can think of. This also applies to components of machines, such as a jet engine of an airplane or a drill of an oil rig. WHAT IS INTERNET OF THINGS?? The Internet of Things(IoT, sometimes also called as Internet of Everything) is a network of physical objects or “things” embedded with electronics, sensors, software and connectivity to enable objects to exchange data with the manufacturer, operator and also with other connected devices based on the infrastructure of International Telecommunication Union's Global Standards Initiative. By embedding short-range mobile transceivers into a wide array of additional gadgets and everyday items, allowing new techniques of communication between people and things, and also between things, the term 'Internet of Things' enabling new forms of communication between people and things, and between things themselves, the term "Internet of Things" depicts various technologies and research disciplines that enables the Internet to reach out to the real world of physical objects. The Internet of Things is a computing concept that portrays a future where day-to-day physical objects will be connected to the Internet and be able to recognize themselves to other devices. The term is closely associated with RFID (Radio Frequency Identification) as a method of communication. It may also include other sensor technologies, wireless technologies or QR codes. The IoT is important as an object that can represent itself digitally becomes something greater than the object by itself. Now no longer the object just relates to us, but it is connected

to the surrounding objects and database data. This will result in communication between objects. When many objects act in unison, they are known as having 'ambient intelligence'. Most of us think about being connected in terms of computers, smartphones, tablets, and many such electronic devices. IoT describes a world wherein anything and everything can be connected and communicate with each other in an intelligent fashion. In other words, with Internet of Things, the physical world is becoming one big information system. It is becoming connected! From any place, at any time, connectivity for anyone, we will now have connectivity for anything!

WHY INTERNET OF THINGS? • Dynamic control of industry and daily life • Improve the resource utilization • Better relationship between human and nature • Forming an intellectual entity by integrating • Human society and physical systems • Universal transport & internetworking • Accessibility & Usability • Acts as technologies integrator • Improved security • Faster and better decision making • New business opportunities and revenue streams

APPLICATIONS • Media • Environmental monitoring • Infrastructure management • Manufacturing • Energy management • Medical and healthcare systems • Building and home automation • Transportation • Large scale deployments .

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Amey Jog

How to take Care of Your laptops battery

We've all been there. You're in a meeting, or on the road, or in a classroom, and you find, to your horror, that your laptop is nearly dead. But with the right practices, stretch your battery at that very moment. Power Management So where do you start? Begin by visiting the Power Settings corner of your laptop. Many computers offer the ability to switch to an "Eco mode" that automatically adjust the way power is used (such as dimming your screen brightness) to conserve battery energy. Also pay attention to hibernation modes. Ideally, you want your laptop to enter into hibernation before the battery is totally drained – as well as during downtime when you won't be using the laptop for a while. Discharging You don't need to totally discharge a battery and let it die to somehow reboot it – this is a dangerous practice that's very hard on your battery. It is a smart idea, however, to do a healthier battery discharge a couple times a year. Let your battery energy grow low (without booting it — aim for around 5 percent) and then fully recharge it, all in one go. This maintenance helps calibrate the battery gauge. The battery itself So the best thing you can do for your battery is charge when it reaches 40 percent, and unplug it when it goes past 80 percent. Obviously this means applying a little OCD to when you plug and unplug your charger, but your battery will thank you in the long term by lasting longer. Avoid extreme temperatures Cold temperatures usually aren't a problem, and storing a battery in a cool place is recommended, but don't leave your laptop in freezing temperatures, ever. Too much cold can kill the battery permanently. Cleaning Most people just let their laptop battery sit, snug inside the laptop, doing its job. But it's a good idea to take your battery out from time to time and show it a little love. Every few months, detach your battery and give it a careful wipe with a soft cloth – get rid of any dust, and make sure the contact points are especially clean.

0808CS211001
Aadish Jain

How to get an Internship

We have heard many students and career experts talking about internships. But do we know how to get an internship in a good multinational company? While applying for an internship, many companies state their terms that they will pay the student based on performance. This criterion is nothing but the skills and efforts which the firm is searching for. If the style of work, the results and outcomes of the work are quite impressive to them then they might pay the student a certain amount as a stipend. Sometimes they might hire the student as a permanent employee straight after completion of degree course that the student can join in that company as a software analyst if the course is Computer Engineering. But the point is, What are the qualities that the internship employers, as well as the recruiters, search for in any student in today's world? They look for confidence, culture fit, knowledge, manners, attitude, communication skills, and analytical skills, last but not the least decision-making ability with honesty. If a candidate has these skills then he/she is a perfect candidate for that particular internship. But sometimes in software industries the companies who have high aspirations like Microsoft, Google, Oracle etc. along with skills they also demand referrals. The applying candidate must have some connections with some employee of good rank for an internship. This is the procedure if the candidate is applying normally. Another method is getting the internship through various coding contests. If the candidate wins such type of contests he/she is given an internship along with a good stipend. But suppose the candidate has managed to get an interview for the internship he/she is halfway there. So next step would be to give the interview properly. While the interview puts less pressure on the physical appearance, it is still a very important step in the process of landing that internship. The most important thing to be remembered for a phone interview is not to interrupt. Wait for an opening. Listen and respond to the questions. Keep the answers brief, and address the interviewer's questions without launching an in-depth tale of your life story. In case of In-person interviews it is necessary to dress the part, so knowing what kind of dress code is required for the industry you're interviewing for is crucial. The questions asked should be answered honestly and with firmness in attitude and voice because many a man's body language speaks up many things and finally the candidate is rejected. So it is better to practice it once before experiencing it. But still no one knows what is there for tomorrow, success or failure. The only thing is "Don't give up". Every rejection is a new opportunity to look for a new opportunity. And always believe you're not going to get every internship you apply for. You're going to receive a lot of "Sorry, we've chosen someone else's and even more opportunities will pass without a response at all. Never be discouraged. To get an internship, you have to be a special breed of persistent. Hence, the aim should be "Keep on Trying".

Net Neutrality

Internet is free source of geneng information. It allows people to connect and exchange information freely. Many of us must be reading about this for the first me, for the rest they must have heard it but not sure, what it is actually related to? WHAT'S NET NEUTRALITY? Net neutrality is one of the biggest issue debated globally by the telecom regulators and TRAI is also in the process of finalising what will be a landmark recommendaon for Indian telecom. Net neutrality means that the individual should be free to use all contents and applicaons equally, without Internet service providers(ISP) discriming against specific online services or websites. In other words, it is the principle that the ISP that connects you to the internet does not get to control wha you do on the internet. In most of the countries there are rules to prevent internet service providers from interfering with how the user makes use of the internet. For example we pay for the internet to ISP, we can use it however we see fit and the ISP has nothing to do with how we use it. What will happen if there is no net neutrality? ISPs will have the full control of internet traffic so that they can derive profit from it. For example some ISPs believe that they can earn more by charging separately for some services like Youtube by giving a reason that Without net neurality, the internet as we know it will not exist. Instead of free access, there could be "package plans" for consumers. To access internaonal websites, you may have to pay a more. 46 Without net neurality, the internet as we know it will not exist. Instead of free access, there could be "package plans" for consumers. For example, if you pay Rs 500, you will only be able to access websites based in India. To access internaonal websites, you may have to pay a more. Or maybe there can be different connecon speed for different type of content, depending on how much you are paying for the service and what "add-on package" you have bought. Lack of net neutrality, will also spell doom for innovaon on the web. It is possible that ISPs will charge web companies to enable faster access to their websites. Those who don't pay may see that their websites will open slowly. This means bigger companies like Google will be able to pay more to make access to Youtube or Google+ faster for web users but a startup that wants to create a different and beer video hosng site may not be able to do that. What are public reaon to the concept of net neutrality? People are trying on their part to oppose this concept by tweeng , by posng status on social networking or blogging. Some held conference to make people aware of this cruel step of ISP. There were also strikes carried out by people for net neutrality. Since this topic has become a naonal issue we all should bring to people's noce to oppose this concept and not to support it, for user's rights.

0808CS211029
Anshika Sahu

The Blue Brain Project

One of the most noteworthy ongoing projects is the Project Blue Brain. This revolutionary finding has the potential to shape the future to enormous extents. IBM in partnership with scientists at Ecole Polytechnique Fédérale de Lausanne's (EPFL) Brain and Mind Institute, will begin simulating the brain's biological system. It was founded by Henry Markram at the EPFL in May 2005 and is expected to near completion around 2023. What is Blue Brain? It is the name of the world's first virtual brain, which means a machine that can function entirely as a human brain. The scientists are in research to create an artificial brain that can think, respond, take decision and keep anything in the memory. After the death of the body the virtual brain can act as a man. Therefore, we will never lose the intelligence, knowledge, personality, feelings and memories of the person. The simulations of human brain in this project are carried out on a Blue Gene supercomputer built by IBM. Hence the name "Blue Brain". This is an attempt to reverse engineer the human brain and recreate it at the cellular level inside a computer simulation. The human brain can be mapped to the computer and referred later for reasons and decisions. The research involves studying slices of the brain using microscopes and patch clamp electrodes. Data is collected about different neuron types, which is used to build biologically realistic models of neurons and networks of neurons in the cerebral cortex. Such simulations scaling to 48 The scientists are in research to create an artificial brain that can think, respond, take decision and keep anything in the memory. After the death of the body the virtual brain can act as a man. The size of a honey bee brain and rat brain have been obtained in accordance with the scheduled timeline. Human brain simulations will take nearly a decade more! There are three main steps to building the virtual brain: 1) Data acquisition- involves taking brain slices, placing them under a microscope and measuring the shape and electrical activity of individual neurons. 2) Simulation- The simulation step involves synthesising virtual cells using the algorithms that were found to describe real neurons. The algorithms and parameters are adjusted for the age, species, and disease stage of the animal being simulated. 3) Visualisation of results- RTNeuron is the primary application used by the BBP for visualisation of neural simulations. The software was developed internally by the BBP team. It is written in C++ and OpenGL. What is the importance of this project? One of the major goals of the project are to gain a complete understanding of the brain and to enable better and faster development of brain disease treatments. Making decisions in the absence of a person, using the skills and intelligence of a person after death, understanding the activities of the animals, allowing the deaf to hear through direct nerve simulation are few of the things that can be achieved. The most important factors that lead to the development of this project are:

- Brain disease treatments- There are about 560 brain diseases. The success of this project can help cure diseases like Parkinson's, Alzheimers.
- Scientific curiosity about consciousness and the human mind- the study of the conscious and subconscious mind.
- Integration of all neuroscientific research results worldwide- the different results and developments can be added and summed up to reach several important conclusions.
- Progress towards building thinking machines- This is the boom up approach. This will help to ease the human time and efforts.

Analyzing Social Media

STUDENT Nowadays, online social network becomes a popular mean of people's social interaction. The social networking sites become ubiquitous and important component of an individual's life. Per day, hundreds of Millions of users share their emotions, thoughts, feelings and opinions on social networking sites. The vast textual information available on these sites is one of the major sources for mining people's opinions and emotions, which will help to make better decisions in different domains. Opinion mining and sentiment analysis is the automated and computational study of recognizing emotions and detecting polarity. These two fields use data mining and natural language processing (NLP) techniques to extract the knowledge from the source of information available on World Wide Web. The two terms sentiment analysis or opinion mining can be used interchangeably. Opinion mining extracts and analyses people's opinion about an entity while sentiment analysis identifies the sentiment expressed in a text then analyses it. Therefore, Sentiment analysis aims to automate the task of finding opinions, identifying the sentiments they express, and then classifying the sentiment polarity. People's opinion plays a crucial role in decision making in various domains. In the real world, organizations and businesses want to find their consumer feedback about their product or services. In recent years, sentiment analysis applications have spread through many domains from recommendation systems, Ad placements, and trend prediction to healthcare and politics. Recent years witnessed the explosive growth of social media (like blogs, reviews, forums, comments and posts on social networking sites) on the web. Nowadays the organizations are not dependent on opinion polls, surveys and focus groups due to the huge amount of data available publicly. The task of mining opinion is formidable due to the need to check the individual web sites. It is very difficult, for a human reader to identify the relevant sites and extract the opinions on them. Therefore, there is need of automated sentiment analysis. Most of the organizations are using their own analysis tools to find the opinions of the consumers. Per day, hundreds of Millions of users share their emotions, thoughts, feelings and opinions on social networking sites. The vast textual information available on these sites is one of the major sources for mining people's opinions and emotions. 50 Machine learning based and lexicon based approaches are widely used for sentiment analysis by computer scientists and engineers. Few research studies have combined these two approaches to get relatively better performance. The machine learning approach uses different classification techniques like Naive Bayes, Maximum Entropy and Support Vector Machine for classifying text. The Lexicon based approach uses a sentiment dictionary with opinion words and match them with the data to determine polarity whether it is positive or negative. The hybrid approach combines the machine learning and lexicon based techniques to overcome their individual drawbacks and benefit from each other's merit. Recent approaches able to seize the conceptual rules that administer the sentiment. Future opinion-mining systems need wider, broader and deeper knowledge bases. The sentiment analysis techniques must be combined with reasoning methods that are more deeply inspired by human thought and psychology. This will lead to a better understanding of natural language opinions and will more efficiently bridge the gap between unstructured information and structured machine processable data.

Applications of Image Processing

In image processing basically an image is studied by using various ways in order to convert an image into digital form so we can perform some operations on it, in order to get an enhanced image or to extract useful information from it. Here, in which the input is an image, like photograph and output may be an image or traits associated with that image. Usually Image Processing system treats an image as a two dimensional signal while applying already set signal processing methods for it. Image processing basically includes the following three steps. 1. Importing an image using an optical scanner or by digital photography. 2. Analyzing and manipulating the image which includes data compression and image enhancement and some patterns that are not visible to human eyes like satellite photographs. 3. Output is the last stage in which result can be a changed image or report that is based on image analysis. The purpose of image processing is divided into five groups & they are as follows: • Visualization – Here the objects are observed that are not visible. • Image sharpening and restoration - To create a better image. • Image retrieval - obtain for the image of interest. • Measurement of pattern – Measures various objects in an image. • Image Recognition – Distinguish the objects in an image.

Readia, a start-up in Israel, has come up with its trademark image processing technology to detect fatty hard plaques in the arteries and help doctors determine whether surgery is needed or not. Some of the fields in which digital image processing is widely used are mentioned below: • Image sharpening and restoration • Medical field • Remote sensing • Transmission and encoding • Machine/Robot vision • Colour processing • Pattern recognition • Video processing • Microscopic Imaging

How image processing will make a change in the future? Like the daVinci system the medical robots, that allow doctors to remotely perform delicate diagnostic and surgeries by "seeing" extremely high quality 3-D images of what they couldn't have seen otherwise. Readia, a start-up in Israel, has come up with its trademark image processing technology to detect fatty hard plaques in the arteries and help doctors determine whether surgery is needed or not. So-called 'Social X-ray' glasses are being developed to help those suffering from autism decipher body language. Inbuilt grain-sized cameras capture images of faces and use software to analyze and compare the various facial expressions (like confusion, anger, agreement) with the known expressions in a database. The recognized information is then relayed to users through attached headphones. "Human beings tend to process visual information faster and more accurately than text. A picture really can speak thousand words. Image processing will move the world, just how text search did last decade," says Nainesh Rathore who is the CEO of Imaginics. Using object recognition, Imaginics has come up with a unique visual search engine for complicated industrial products which are hard to describe in words to connect buyers and sellers in the industrial workplace. Image Processing is a field wherein job opportunities are mushrooming rapidly and a field mainly for research oriented work to be taken. Image Processing is a field wherein job opportunities are mushrooming rapidly and a field mainly for research oriented work to be taken.

Dynamic HTML Code Generation

The project is based on the concepts of Convolutional Neural Network (Deep Learning). It is a class of deep neural network most commonly applied for analysing visual imagery. A convolutional neural network consists of an input and an output layer, as well as multiple hidden layers. The hidden layers of a CNN typically consist of convolutional layers, RELU layer i.e. activation. Task Definition The project is aimed at creating a web page in Hyper Text Mark-up Language using Machine Learning. The basic functionality of this project is- The user will draw a basic wire frame structure of a website on a screen/board/white sheet, which would be captured by camera and the HTML code will be generated on the machine. This project starts with website study which includes studying various websites (social media, ecommerce, educational etc) and understanding the structures and creating 50 wireframes using moqups webapp. Further the project proceeds with dataset Creation which includes deriving basic shapes that are mostly used in website designing. Further the shapes were classified in different categories –basic and advanced. Then dataset of basic shapes(8000 images) were created.(Square, Rectangle, Circle, Radio, Images, Search-box, Checkbox). DEPARTMENT OF COMPUTER ENGINEERING 5 Department of Computer Engineering-Technical Magazine 2018-2019 Approach The project could be done with different approaches: • Opencv: This approach was inappropriate because irregular shapes or some distortion in the shapes are not recognized by Open.

0808CS211034
Anurag Kumar Prajapati

Contiguous Cattle Tracking Device for protection against larceny and enigmatic animal behaviour

The number of cattle that are missing is increasing day by day. The reason behind this might be due to cattle theft, or due to animals forgot the directions to their owner's place or some other problem. Currently to identify the owner of the lost cattle, the radio-frequency enabled ear-tag (RFID) with a 12-digit unique identification number is used, like the Aadhaar, affixed as a yellow tamper-proof tag inside the ear of animals like cows and buffaloes. This problem can be solved if we have a method that could keep track of the animals based on its location, more precisely Geolocation. We implemented a small device like a GPS tracking unit along with GSM technology with the help of IOT concepts implemented into a tracking collar that can be used for cattle, and a mobile application that could keep track of the cattle's Geo-location that were tagged. The animals that are to be tagged are well known to owner of the cattle than us because of his knowledge on his cattle.

0808CS211029
Anshika Sahu

Data Mining

Data mining is the practice of automatically searching large stores of data to discover patterns and trends that go beyond simple analysis. Data mining uses sophisticated mathematical algorithms to segment the data and evaluate the probability of future events. Data mining is also known as Knowledge Discovery in Data (KDD). Automatic discovery of patterns. Prediction of likely outcomes. Creation of actionable information. Focus on large data sets and databases. The key properties of data mining are: Automatic Discovery: Data mining is accomplished by building models. A model uses an algorithm to act on a set of data. Data Mining 7 The notion of automatic discovery refers to the execution of data mining models. Data mining models can be used to mine the data on which they are built, but most types of models are generalizable to new data. The process of applying a model to new data is known as scoring Prediction Many forms of data mining are predictive. For example, a model might predict income based on education and other demographic factors. Predictions have an associated probability (How likely is this prediction to be true?). Prediction probabilities are also known as confidence, (How confident can I be of this prediction?). Grouping Other forms of data mining identify natural groupings in the data. For example, a model might identify the segment of the population that has an income within a specified range, 8 that has a good driving record, and that leases a new car on a yearly basis. Actionable Information: Data mining can derive actionable information from large volumes of data. For example, a town planner might use a model that predicts income based on demographics to develop a plan for low-income housing. A car leasing agency might use a model that identifies customer segments to design a promotion targeting high-value customers. Data Mining and Statistics: There is a great deal of overlap between data mining and statistics. In fact most of the techniques used in data mining can be placed in a statistical framework. However, data mining techniques are not the same as traditional statistical techniques. Traditional statistical methods, in general, require a great deal of user interaction in order to validate the correctness of a model. As a result, statistical methods can be difficult to automate. Moreover, statistical methods typically do not scale well to very large data sets. Statistical methods rely on testing hypotheses or finding correlations based on smaller, representative samples of a larger population. 9 Data mining methods are suitable for large data sets and can be more readily automated. In fact, data mining algorithms often require large data sets for the creation of quality models. Applications of Data Mining in different fields: Telecom, Media & Technology: In an overloaded market where competition is very high, the answers are often within your consumer data. Telecom, media and technology companies can use analytic models to make sense of mountains of customers data, helping them predict customer behaviour towards product and offer highly targeted and relevant campaigns. Education: With unified, data-driven views of student progress, educators can predict student performance before they set foot in the classroom – and develop intervention strategies to keep them on course.

SMART DRIVER MONITORING SYSTEM

Now a days the road accidents percentage is growing exponentially. One of the main causes of the road accidents are human errors such as alcohol consumption, drowsiness, over-speed, distraction, lack of knowledge and inattention. To avoid that human error in the causes of road accidents we are implementing a project named Smart Driver Monitoring System. There are some existing methods to solve this problem like manually detecting alcohol by the traffic police, drowsiness video sensors, alcohol detection system. The drawbacks of existing methods are the traffic police have to check each and every person manually, so the time is wasted and some persons may skip the traffic police and only alarming system is included in the previous methods. In our project we solved the human errors in accidents such as alcohol consumption, over-speed of the driver by using the sensors and we sent a message to the traffic police mobile phone about the vehicle details and the location of the vehicle using GPS and GSM technologies and we SMART DRIVER MONITORING SYSTEM. P. Lakshmi Kumari, P. Vasanthi, Y. Lahari, Mentor: Dr. K. Praveen Kumar checked the drowsiness of the driver and an alarm rang when the driver closed his eyes for 2 seconds and we added an emergency button which is very helpful in the emergency situations like brake failure of the vehicle, loss of control of the vehicle or any fire accident occurs. So in that situations when the driver pressed the emergency button then immediately a message along with the location and an alert was sent to the traffic police as well as the monitoring department at bus stand as Emergency Detected.

0808CS211087
Khushi Sharma

Dark Web

When we think of the web, most of us think of sites like Google, Facebook, Twitter. The web that is accessed through search engines like Google and Bing is only a tiny percentage of the “web” that’s out there, Known as the “surface web”, “indexed web”, and “visible web”. The current estimated size of the surface web, according to one source, is close to 5 billion pages. However, the surface web is believed to make up only a tiny percentage of the World Wide Web, with much of it existing on the “deep web” and the “dark web”. No one really knows how big the deep web is, but it is certainly larger than the surface web, with some estimates saying it may be 500 times as large as the searchable web. According to a study published in Nature in 2015, Google indexes just 16 percent of the surface web, and none of the deep web, meaning that a Google search will show up less than 1 percent of the information that exists online. The analogy of an iceberg is often used to describe the difference between the surface web and the deep web we can see a small part of it on the surface, but a lot more lies beneath. Websites on the dark web don’t end in “.com” or “.org” or other more common web address endings; they more often include long strings of letters and numbers, ending in “.onion” or “.i2p.”

DARK WEB INSPECTION MARCH 2020 18 HOW DARK WEB ENCRYPTION WORKS TOR and similar services operate by bouncing your traffic around the web so that your ISP does not know what sites you visit, and the sites you visit do not know your physical location. TOR users do not connect directly to the website or service they want to visit. Instead, they bounce through a series of nodes on the network. Each node only knows the data it receives and the node to which it is passing the data. So while the initial node knows it is being connected to by, for instance, MK’s computer, it doesn’t know which website MK is planning to visit, as MK’s connection will be bounced through further nodes before connecting to its final destination. This website will only know the final node that connected to it, it will not know that MK’s computer was the one that originally sent the request to connect to the service. This complex encryption model makes it very difficult to trace back who has visited a site using the dark web, guaranteeing users a level of anonymity they do not have on the surface web.

DEEP WEB VS DARK WEB While the terms are often used interchangeably, the deep web and the dark web are not the same thing. The deep web refers to the parts of the World Wide Web that are not indexed by search engines. It includes things like databases, email services, online banking services, and other services protected by paywalls or passwords. The dark web is relatively a small part of the deep web. Websites on the dark web are not accessible through normal browsers and can only be accessed through special software such as TOR or I2P (Invisible Internet Protocol). The appeal of the dark web is its anonymity. It has a high level of encryption that means it is difficult to identify either those visiting websites or hosting websites on the dark web. TOR is one of the popular services used to visit darkweb sites.

COMPUTER, CHIPS AND CRICKET

The success or failure of any invention, specifically a technological invention, depends on how effectively it serves the society and when the BatSense Chip was welcomed by the cricketing fraternity, this technological invention had its mission accomplished. When Bangladesh's Tamim Iqbal scored his first 100 against England, his coaches would have been able to give him some new insight into why he did so well and how he might replicate that performance. Normally, top-level cricket coaches would give their advice based on what they saw, perhaps helped by video analysis software and some biomechanical analytics about the batsman's movements. Yet Tamim's coaches had some extra help. The Bangladesh star was one of many players using a smart bat with sensor technology in the handle – the first time this had been used at a major cricket tournament. For a while now, cricket coaches and analysts have, during practice, placed sensors on key parts of batsmen bodies – arms, legs, the abdomen and thighs – that generate movements that determine how efficiently the batter hits the ball. Yet whereas the player's body propels the bat, it's the bat itself that actually speeds through the air and strikes the ball. The new sensor tech, named BatSense, was devised by Intel, the International Cricket Council's Innovation partner, and sports start-up Specular. The technology sends real-time data of bat speed and angle from the point the batter lifts the bat, through the downward arc, the moment of impact and the follow through, to an analyst's computer. "A batter needs fast hand-speed to create power through the ball," says England and Wales Cricket Board's lead batting coach, Graham Thorpe. Thorpe explains the necessary bat speed can be created by big, tall players with long levers (arms), like England's Alex Hales and Ben Stokes, but also the short snappy arm movements preferred by shorter players like Jonny Bairstow, Eoin Morgan and Thorpe himself. Each BatSense chip weighs less than 25g and fits into a sleeve covering the bat handle beneath the rubber grip. It contains an Intel Curie compute module, which processes wireless data with motion sensors and built-in algorithms. During the design phase, Specular engineers had to ensure these algorithms produced accurate measures from players' bats. The average batter moves a lot as they wait to hit the ball, like tapping the bat on the ground and shuffling their feet. Some batsmen get rhythm from this, for others it's a habit. From the point of view of the analyst, it's just noise, so the algorithm had to be taught to ignore it. The smallest errors in a batsman's technique can be the difference between them succeeding and failing at international level. Apart from the information about bat speed and angle, there are more pressing things that they need to know. Balance, coordinating movements, tracking the ball with their eyes from the bowler, off the pitch and onto the bat, keeping their head still as they strike the ball and so on. COMPUTER, CHIPS AND CRICKET INSPIRON MARCH 2020 At a Champions trophy event, Intel used a Falcon 8 drone to monitor pitch conditions. The drone carried HD and infra-red cameras to monitor and assess grass coverage, grass health and topology. TV commentators used this information to provide insights into how the pitch might affect play. Bats containing BatSense technology were used in fan zones at the Oval, London, and Edgbaston, Birmingham, during the Champions Trophy.

MUSIC AND ARTIFICIAL INTELLIGENCE

As an ardent music lover, my day begins with two simple things... early morning blues and a dope playlist to combat such symptoms. So many of us like to hit the gym, go for an early morning jog, or just chill out to our favourite Spotify recommended. Music undoubtedly plays a pivotal role in our lives. When we think of AI... it's glistening silver bots, self driven cars and complicated automations that immediately come to mind. Your Spotify recommended? A series of advanced algorithms that adapt to your taste in music, evolving at each step with the data you provide it, to create the perfect personalized tailor made song suggestions at your disposal. It's a uniquely powerful combination of 3 data analysis models. (1) Collaborative filtering-analyse both yours and others behaviour. (2) Natural language processing-analyze text. (3) Audio analysis-analyze the raw tracks themselves combined together you get your weekly recommended from an app that knows you like your best mate. AI has been employed not just in marketing and recommendations. It has also been integrated into music production, creation, mixing and sampling, lyric generation and so on. Some softwares have been programmed to perform the songs as live performances. Some of the popular platforms are Google's magenta, amper, AIVA. All of them have the basic concept: feed the system tonnes of data-from disco classics to indie rock to EDM. It picks up chords, tempo, length, patterns and how notes relate to each other and from that data creates unique self produced melodies. pretty neat if you think about how it transforms an artists one month work into a 120 second process. MUSIC AND ARTIFICIAL INTELLIGENCE Some deliver midi while some deliver audio. This feature can be exploited extensively to create more personalized content for the user.. Sony CSL laboratory distributed the first ever pop song written and produced entirely by AI called daddy's car based on the theme of Beatles. Over 13000 were entered into the program from which a 3.00 minute song was created entirely by AI. Back then popular musician David bowie worked alongside engineers to create an app called Verbasizer in the 90's. It took literary source material as input and randomly reordered them to form lyrics. This shone a new light in the creative writing process. In recent times pop artist Taryn southern, incorporated AI into her album to create "I AM AI" the first ever pop album composed and produced entirely with AI Use of AI in music is seen as unoriginal or threatening to musicians by many. However, AI is merely a tool that can work hand in hand with artists to create revolutionized music. It is only a threat if we deem it to be. By mingling AI into music, we can take music to the next level.

0808CS211136
Rohini Sharma

Digital Marketing

Digital marketing, also called online marketing, is the promotion of brands to connect with potential customers using the internet and other forms of digital communication. This includes not only email, social media, and web-based advertising, but also text and multimedia messages as a marketing channel.

Essentially, if a marketing campaign involves digital communication, it's digital marketing.

Digital marketing and inbound marketing are easily confused, and for good reason. Digital marketing uses many of the same tools as inbound marketing—email and online content, to name a few. Both exist to capture the attention of prospects through the buyer's journey and turn them into customers. But the 2 approaches take different views of the relationship between the tool and the goal.

Digital marketing considers how individual tools or digital channels can convert prospects. A brand's digital marketing strategy may use multiple platforms or focus all of its efforts on 1 platform. For example, a company may primarily create content for social media platforms and email marketing campaigns while ignoring other digital marketing avenues.

On the other hand, inbound marketing is a holistic concept. It considers the goal first, then looks at the available tools to determine which will effectively reach target customers, and then at which stage of the sales funnel that should happen. As an example, say you want to boost website traffic to generate more prospects and leads. You can focus on search engine optimization when developing your content marketing strategy, resulting in more optimized content, including blogs, landing pages, and more.

The most important thing to remember about digital marketing and inbound marketing is that as a marketing professional, you don't have to choose between the 2. In fact, they work best together. Inbound marketing provides structure and purpose for effective digital marketing to digital marketing efforts, making sure that each digital marketing channel works toward a goal.

Quantum Mechanics

Quantum mechanics, science dealing with the behaviour of matter and light on the atomic and subatomic scale. It attempts to describe and account for the properties of molecules and atoms and their constituents—electrons, protons, neutrons, and other more esoteric particles such as quarks and gluons. These properties include the interactions of the particles with one another and with electromagnetic radiation (i.e., light, X-rays, and gamma rays).

The behaviour of matter and radiation on the atomic scale often seems peculiar, and the consequences of quantum theory are accordingly difficult to understand and to believe. Its concepts frequently conflict with common-sense notions derived from observations of the everyday world. There is no reason, however, why the behaviour of the atomic world should conform to that of the familiar, large-scale world. It is important to realize that quantum mechanics is a branch of physics and that the business of physics is to describe and account for the way the world—on both the large and the small scale—actually is and not how one imagines it or would like it to be.

The study of quantum mechanics is rewarding for several reasons. First, it illustrates the essential methodology of physics. Second, it has been enormously successful in giving correct results in practically every situation to which it has been applied. There is, however, an intriguing paradox. In spite of the overwhelming practical success of quantum mechanics, the foundations of the subject contain unresolved problems—in particular, problems concerning the nature of measurement. An essential feature of quantum mechanics is that it is generally impossible, even in principle, to measure a system without disturbing it; the detailed nature of this disturbance and the exact point at which it occurs are obscure and controversial. Thus, quantum mechanics attracted some of the ablest scientists of the 20th century, and they erected what is perhaps the finest intellectual edifice of the period.

0808CS211071
Harsh Sugandhi

CYBERBULLYING

Cyberbullying is a form of online bullying or harassment that occurs over digital devices and platforms. With the widespread use of technology and the anonymity that comes with it, cyberbullying has become more frequent and prevalent. Hidden behind their computer or mobile screens, people don't hesitate in harassing others. This can be clearly seen in the increase in suicide cases due to online bullying. From time to time we even see celebrities facing online trolls and bullies. A recent study by CRY (Child Rights and You), a non-governmental organisation, shows that around 9.2 per cent of 630 adolescents surveyed in the Delhi-National Capital Region had experienced cyberbullying and half of them had not reported it to teachers, guardians or the social media companies concerned. Nationwide, according to research conducted by Symantec, nearly 8 out of 10 individuals are subject to the different types of cyberbullying in India. Out of these, around 63 per cent faced online abuses and insults while 59 per cent were subject to false rumours and gossip which became responsible for degrading their image. The same study ranks India as the country facing the highest cyberbullying in the Asian Pacific region.

Cyberbullying can occur in several forms such as sending, posting, or sharing negative, harmful, false or mean content about someone else. It can include sharing personal or private information causing embarrassment or humiliation. Although it may be difficult to understand how some text on a screen can affect a person drastically, cyberbullying can lead to trauma and various mental health issues. It becomes important to understand that unlike face-to-face bullying one cannot escape such an incessant, insistent and brutal form of torture. It can continue at any time, throughout all hours of the night.

Cyberbullying leaves little opportunity for victims to defend themselves. There are no teachers or parents to see, intervene to put a stop to it. Cyberbullying can also be anonymous, leaving the victim little recourse to even report the bully to an authority figure. The anonymity of social media emboldens people and their hurtful words are left forever on the internet for everyone to watch and read. Blocking or reporting them is not a solution when a new account can simply be created. Even if what is said or posted is false, people tend to believe anything they see online. Thus, cyberbullying can be more detrimental, distressing and damaging to a person.

One of the major weapons to fight against cyberbullying is to create tough and strong laws against it. It becomes even more important to create awareness among youngsters about this issue and such laws so that they can take appropriate measures in times of need. In India, although there is no specific legislation that has provisions against cyberbullying, certain sections in the Indian Penal Code (IPC) deal with cyberbullying in a way. Section 67 of the Information Technology (IT) Act prescribes punishment for publishing or transmitting obscene material in electronic form. Section 507 of the IPC states the punishment for criminal intimidation through anonymous communication while Section 66 E of the IT Act prescribes punishment for violation of privacy.

There are hardly a couple of things which attracted as much attention as the coronavirus and Cryptocurrency was surely one of them. With the first Cryptocurrency being introduced in 2009, the very famous Bitcoin, very few people knew or as much as cared about them. Then one day suddenly, the world was after these decentralised digital currencies and we

could literally look at 800% surge in even satiric and ‘joke’ coins (read DOGE). A person who had invested in these as a part of some truth or dare game was now a millionaire and every newspaper had the same headline. A new trend was here and it was not some dance or meme, but a Laxmi chit fund-sure shot-in a whip way of becoming rich, only difference being, this was actually legit.

Does this not seem too good to be true? Why don’t people buy 20\$ worth of these coins, get rich and end poverty? Because these supposedly new age replacement for real, normal, everyday money were not really so. In Jan 2021, all these crypto currencies crashed leading to \$134B losses. How did this happen? The distrust of governments and unstable market were the main culprits to blame. However, this opened investor’s eyes and the bitter truth of investment was realised yet again, that loss and gain are the two sides of the same coin. Yes, Cryptocurrency is an excellent investment opportunity and could be the boon for our generation or until the next quick money option emerges, but it comes with equally high-risk factors. With no regulatory body or no nodal authority, it is just a peer-to-peer network of transactions and the anonymity worries government and people alike. As of now, crypto can more easily be used for criminal activities rather than daily life transactions. With more developments, maybe a new age of virtual cash could come with crypto as safe as rupee and dollar, but today with the ever-fluctuating rates and such vague nature, further huge advancements are necessary. This tug of war situation is a part of the journey and at the end either Cryptocurrency will be a revolutionary idea or just a primitive prototype of virtual currency which taught quite a few lesson.

With the increase in dependency on electronic devices, it becomes important to teach people the proper ‘netiquettes’. Parents have an important role to play in monitoring their child’s behaviour and activity on the internet. It is also important for schools and educational institutions to have strict guidelines against such behaviour and to provide counsellors to aid the students. Stringent laws need to be made to help ensure that such behaviour doesn’t go unpunished. Social media platforms must be held responsible and should have the means to report and prevent harassment and bullying.

0808CS211204
Vivek Raj Gupta

DATA PRIVACY

Data privacy, sometimes also referred to as information privacy, is an area of data protection that concerns the proper handling of sensitive data such as certain financial data and intellectual property data, to meet regulatory requirements as well as protecting the confidentiality and immutability of the data. Roughly speaking, data protection spans three broad categories, namely, traditional data protection (such as backup and restore copies), data security, and data privacy. Ensuring the privacy of sensitive and personal data can be considered an outcome of best practice in data protection and security with the overall goal of achieving the continual availability and immutability of critical business data.

What are the laws that govern data privacy? As technological advances have improved data collection and surveillance capabilities, governments around the world have started passing laws regulating what kind of data can be collected about users, how that data can be used, and how data should be stored and protected. Some of the most important regulatory privacy frameworks to know include: General Data Protection Regulation (GDPR): Regulates how the personal data of European Union (EU) data subjects, meaning individuals, can be collected, stored, and processed, and gives data subjects rights to control their personal data (including a right to be forgotten).

National data protection laws: Many countries, such as Canada, Japan, Australia, Singapore, and others, have comprehensive data protection laws in some form. Some, like Brazil's General Law for the Protection of Personal Data and the UK's Data Protection Act, are quite similar to the GDPR.

California Consumer Privacy Act (CCPA): Requires that consumers be made aware of what personal data is collected and gives consumers control over their personal data, including a right to tell organizations not to sell their personal data. There are also industry-specific privacy guidelines in some countries: for instance, in the United States, the Health Insurance Portability and Accountability Act (HIPAA) governs how personal healthcare data should be handled. However, many privacy advocates argue that individuals still do not have sufficient control over what happens to their personal data. Governments around the world may pass additional data privacy laws in the future.

What are some of the challenges users face when protecting their online privacy? Online tracking: User behavior is regularly tracked online. Cookies often record a user's activities, and while most countries require websites to alert users of cookie usage, users may not be aware of to what degree cookies are recording their activities.

Losing control of data: With so many online services in common use, individuals may not be aware of how their data is being shared beyond the websites with which they interact online, and they may not have a say over what happens to their data. Lack of transparency: To use web applications, users often have to provide personal data like their name, email, phone number, or location; meanwhile, the privacy policies associated with those applications may be dense and difficult to understand. Social media: Social media posts may reveal more personal information than users realize.

Cyber crime: Many attackers try to steal user data in order to commit fraud, compromise secure systems, or sell it on underground markets to parties who will use the data for malicious purposes. Some attackers use phishing attacks. What are some of the challenges businesses face when protecting user privacy? Communication: Organizations sometimes struggle to communicate clearly to their users what personal data they are collecting and how they use it. Cyber crime: Attackers target both individual users and organizations that collect and store data about those users. In addition, as more aspects of a business become Internet-connected, the attack surface increases. Data breaches: A data breach can lead to a massive violation of user privacy if personal details are leaked, and attackers continue to refine the techniques they use to cause these breaches. Insider threats: Internal employees or contractors might inappropriately access data if it is not adequately protected.

Why is Data Privacy important? In many jurisdictions, privacy is considered a fundamental human right, and data protection laws exist to guard that right. Data privacy is also important because in order for individuals to be willing to engage online, they have to trust that their personal data will be handled with care. Organizations use data protection practices to demonstrate to their customers and users that they can be trusted with their personal data. Business Asset Management: Data is perhaps the most important asset a business owns. We live in a data economy where companies find enormous value in collecting, sharing and using data about customers or users, especially from social media.

Regulatory Compliance: Managing data to ensure regulatory compliance is arguably even more important. A business may have to meet legal responsibilities about how they collect, store, and process personal data, and non-compliance could lead to a huge fine. If the business becomes the victim to a hack or ransomware, the consequences in terms of lost revenue and lost customer trust could be even worse. Personal data can be misused in a number of ways if it is not kept private or if people don't have the ability to control how their information is used: Entities may sell personal data to advertisers or other outside parties without user consent, which can result in users receiving unwanted marketing or advertising. When a person's activities are tracked and monitored, this may restrict their ability to express themselves freely, especially under repressive governments.

For individuals, any of these outcomes can be harmful. For a business, these outcomes can irreparably harm their reputation, as well as resulting in fines, sanctions, and other legal consequences. In addition to the real-world implications of privacy infringements, many people and countries hold that privacy has intrinsic value: that privacy is a human right fundamental to a free society, like the right to free speech.

0808CS211150
Saumyata Tiwari

DATA VISUALIZATION AND POWER

BUSINESS INTELLIGENCE

Every day a huge amount of data is generated. This data can even vary in nature and structure. A business, for example, can have data on sales revenue, marketing performance, customer interactions, inventory levels, production metrics, staffing levels, costs, etc. But with so much data to sift through, it can be difficult for people to see the story it tells. Data visualization helps you turn all that granular data into easily understood, visually compelling—and useful—business information. Data visualization is the graphical representation of information and data. By using visual elements like charts, graphs, and maps, data visualization tools provide an accessible way to see and understand trends, outliers, and patterns in data. In the world of Big Data, data visualization tools and technologies are essential to analyse massive amounts of information and make data-driven decisions.

Hidden within your data lie important insights that can help drive the business forward. But the challenge is that you can't always connect the dots by looking at raw numbers alone. When you look at your data presented in a visual format, patterns, connections, and other insights emerge that would otherwise remain out of sight.

Our eyes are drawn to colours and patterns. We can quickly identify red from blue, and a square from a circle. Our culture is visual, including everything from art and advertisements to TV and movies. Data visualization is another form of visual art that grabs our interest and keeps our eyes on the message. When we see a chart, we quickly see trends and outliers. If we can see something, we internalize it quickly. It's storytelling with a purpose. If you've ever stared at a massive spreadsheet of data and couldn't see a trend, you know how much more effective a visualization can be.

It's hard to think of a professional industry that doesn't benefit from making data more understandable. Every STEM field benefits from understanding data—and so do fields in government, finance, marketing, history, consumer goods, service industries, education, sports, and so on. While we always increasing talk about data visualization there are practical, real-life applications that are undeniable. And, since visualization is so prolific, it's also one of the most useful professional skills to develop. The better you can convey your points visually, whether in a dashboard or a slide deck, the better you can leverage that information. Skill sets are changing to accommodate a data-driven world. It is increasingly valuable for professionals to be able to use data to make decisions and use visuals to tell stories of when data informs the who, what, when, where, and how. While traditional education typically draws a distinct line between creative storytelling and technical analysis, the modern professional world also values those who can cross between the two.

Today, data visualization tools run the gamut from free versions you can access with a browser to feature-rich platforms that integrate with a wide variety of mainstream business applications. One such tool is Power BI, an interactive data visualization software product developed by Microsoft with a primary focus on business intelligence (BI). Power BI offers

cloud-based services for interactive visualizations with a simple interface for end-users to create their own reports and dashboards.

Power BI was first conceptualized by Ruler and Dhers Netz of the SQL server coverage services team at Microsoft. It was further designed by West Chadic George in the year 2010 and named Project Crescent. In 2011, It was bundled with SQL Server Codenamed Mount McKinley. Microsoft unveiled the first preview to Power BI in September 2014. And finally, the first version of Power BI was released on 24 July 2015. It was based on Excel Based Add-ins like Power Query, Pivot, view, and Map.

Today Power BI comes across as one of the most powerful and efficient data visualization and analytical tool. Some of the many advantages it offers include pre-built dashboards, real-time updates, secure and reliable connection to your data sources in the cloud or on-premises, integration with both Python and R coding, etc. Moreover, it is backed by artificial intelligence and machine learning. This tool, however, currently has some disadvantages in terms of sharing the reports made and certain types not being compatible with it. These are likely to be overcome in the future as Power BI is further developed.

0808CS211154
Sheena Soni

ETHICAL HACKING

The term ‘hacking’ has a very negative connotation attached to it. It refers to gaining unauthorized access to data in a computer or system. It is the unlawful use of another’s resources. However, hacking when done with permission is not only legal but has several advantages to organizations and companies. What kind of vulnerabilities does a hacker see? What information might be targeted by a hacker? What will the attacker do with the information and how many people notice the attempt? What can be done to fix the vulnerabilities in the system? All these questions can be answered by an ethical hacker. Ethical hacking is the act of identifying vulnerabilities in an application, system, or organization's infrastructure that can be exploited by an attacker. By lawfully hacking into networks and looking for weak places, ethical hackers (also known as the white hats) try to avoid cyberattacks and security breaches.

Ethical hacking has great importance in today’s times. Finding vulnerabilities from the perspective of an attacker, addressing weak areas in a system and putting in place a secure network to avoid security breaches are some such examples. Ethical hacking can also be necessary to earn the trust of customers and investors by assuring the security of the products and data. It prevents people with malicious intentions to gain access to sensitive or confidential information. One major use of ethical hacking is to protect the national security of a country. Any breach or loophole in the information or defence databases of the country can put the safety of its citizens at great risk. Thus, impenetrable defences need to be forged and erected so that no enemy nation or terrorist organisation can obtain official, classified government data. Using ethical hackers is one such way to ensure cybersecurity. They can identify the vulnerabilities and help protect data from cyberattacks and breaches. For example, in the United States of America, the “Hack the Pentagon” event, led by the Defense Digital Service, kick-started the partnership between the Department Of Defense and the white hat community. In addition to finding 138 vulnerabilities, they also uncovered the need to have an enduring open door for hackers to report the vulnerabilities they find. Later, they also started the ‘Vulnerability Disclosure Policy’ which has become one of the largest disclosure programmes in the world. Ethical hacking has five major phases. Reconnaissance is the preparatory phase where the hacker collects preliminary information about the target prior to the attack. Through scanning, the hacker identifies a quick way to gain access to the network by exploiting the vulnerabilities of the system. After gaining access to the network, the user privileges are escalated to control the systems connected to it. Having gained the access, the hacker tries to maintain it by securing access to the organization’s Rootkits and Trojans. These are used to launch additional attacks on the network.

THE EMERGING TECHNOLOGIES

CRISPR, Quantum, Graphene, Smart Dust, Digital Twins, the Metaverse... You've heard about it all. Seen it all. Read it all. These technologies no longer hold any secrets for you. Hell, you've probably mentioned them over dinner or at work and have become the go-to person for questions about future innovations.

Yet, technology is ever-changing, and this precious knowledge must be both managed and updated regularly. With this in mind, I've put together a list of the top future technologies that are not on the public's radar as of today but are likely to make big waves in the future.

1. **Femtosecond Projection Two-Photon Lithography.** Researchers have developed a method that uses lasers to project millions of points simultaneously onto 3D-printing material, instead of using one point at a time. And because they're bad at branding, they called it Femtosecond projection TPL. To easily understand FP-TPL, simply imagine using a million heated needles to strategically melt a block of wax versus using a single needle. This means that incredibly tiny structures can be 3D-printed much, much faster (a thousand times faster, give or take), while still ensuring a good quality of the build. How will it change the world Quick discoveries around materials have led researchers to think that they will be able to build small but imagination-baffling structures in the near future. Once the quality can be controlled over large scales, one could easily imagine this technology being used for the creation of healthcare-related nanorobots, allowing for the treatment of a multitude of diseases on the molecular level.
2. **LiFi** What is it? LiFi aims to use light to transmit information from point A to point B. The technology works by encoding digital data and turning LED bulbs on and off faster than humans can notice to transfer it. The light then travels to a photoreceptor, which can decode and translate the data to a more classic radio frequency (WiFi, 4G, 5G...). There are a lot of advantages to doing things this way. What with light being used, the speed at which the information is transmitted is very, very high — up to 100 Gbit/s, in theory; 5 times faster than 5G. Furthermore, the sheer number of LED bulbs already around us hints at a potential future wherein (cheap) access points to receive data are everywhere. Finally, the light waves used as the basis for LiFi do not pass through walls (but can however be reflected off of them). The risk of hacking is therefore much lower than with WiFi, though this seriously limits indoor use cases. On the other hand, the use of LiFi requires one to be near an operating light source. Its range is thus very limited, and interference is possible with other light sources such as natural sunlight. How will it change the world As of today, this future technology is very much of a niche, despite having been hyped in some circles for half a decade now. One obstacle to popular adoption is the size and price of photoreceptors. As such, key use cases are within areas that are particularly sensitive to hacking and/or electromagnetic interference, such as hospitals, aircraft, military operations...
3. **Energy-storing Bricks** For these bricks to store and then release energy, researchers heat them to 160 degrees and vaporize their surface with hydrochloric acid mixed with an organic compound called EDOT. When in contact with hematite, this mix causes a chemical reaction, creating a new plastic nanofiber coating called PEDOT. the amount

of energy these bricks can store is still low, but the proof of concept is a staggering success. It's possible to power a small lamp for 50 minutes with 60 bricks, which doesn't sound like much until you realise it only takes 13 minutes for these bricks to recharge. This future technology also has a long lifespan, since even after 10,000 storage and retrieval cycles, the bricks still retain 90% of their original capacity, without altering the rate of charge and discharge.

How will it change the world? The main benefit of this technology of the future would come about when used at a house equipped with solar panels. The bricks could then store unused electricity and thus compensate for the intermittence of this renewable energy. This would make our homes more self-sufficient in energy and less dependent on electric cables and/or the likes of lithium batteries. Discussions are currently underway with several companies in Europe and the United States to consider its commercialisation and know that the next generation of bricks will be able to increase its energy capacity by 50%. Enough to charge a laptop? Only time will tell.

4. **Robotic bees** Details are scarce, but most researchers estimate that the bees would work by attaching horse hair coated with ionic liquid gel to a tiny drone. The hair picks up pollen from one flower, and moves it to the next. Researchers at Harvard have long been working on "RoboBees" using such techniques. What Walmart offers on top is a wide array of sensors, cameras, artificial intelligence... to locate the relevant crops and pollinate them as needed. How will it change the world? If the costs of operating such future technology continues to decrease, we could see autonomous insect pollinate large fields in the coming years, which could save thousands of farmers from ruin, and ensure we can still have almond milk on the superstores' shelves.

5. **Unnamed Dynamic Neural Networks Technology** Neural network uses hidden layers to break down information (the input-images, audio, videos, handwritten text...) into tiny pieces of easily understandable components, allowing a computer to inform a prediction about the nature of said input. It does this thanks to a wide array of training data and mathematical models. In doing so, it works "similarly" to our brain, hence the technology's name. This is far from new, but the world of data science has been on the lookout for faster and more efficient ways of using neural networks to serve the upcoming IoT revolution. How will it change the world? First and foremost, the technology reduces computing resources required of the host CPU and cuts back on costs of running data centres, something which seems benign compared to all the issues discussed in this article, but is nevertheless incredibly important at scale. It also reduces the environmental costs of these centres, which is always a plus.

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