TORQUE

TECHNICAL MAGAZINE

VOL 2
2019-2020

NEO-HUMANS

How far is too far?

Can you imagine yourself living, say, 50-80 years back? Life then was not as 'lit' with technology as it is now. Diseases that were deadly back then are now curable through readily available medication. The world has shrunken to a global village, and soon some of us will go backpacking to Mars and Moon! Elon Musk, founder and CEO of tech giants like SpaceX and Tesla, has already announced that we have (already) become Cyborgs!
If someone time travelled (a tangible near-future thing!) from, say, 80 years back to today, scientifically, we will be regarded as superior human beings compared to them. We now can do many, many things today that were considered impossible back then. Technology has enhanced our bodies, our minds and our lives, equipping us with greater powers making us 'Neo Humans'.

How have we achieved this? Scientists believe that the journey to a 'Neo Revolution' has already begun and we are moving faster than we thought. The quest for newer discoveries is never-ending and is only becoming stronger day by day. With the advent of Artificial Intelligence and Data Science, technology has become so profoundly engraved and integrated into our lives that it has become an indispensable part of us. We may use some aspect of technology in our everyday life and still might not recognize using it consciously!

How far is too far? Is AI really our friend? Or is it a befriended enemy? With so much going on, individuality is getting diluted. Having your own avatar who looks, speaks and talks exactly like you is no longer a sci-fi thing. It is just a clever computer simulation but can be potentially misused. Deadly AI creations like Deepfake are already into the game! Hence, ethics become vital, and organizations all around the world have already started addressing it.

We must be grateful that science has helped us evolve and enhance to greater heights in a very, very short period. It is now on us, as 'Neo Humans' to be resolute about where we want our future to go. Caution- The destination may arrive faster than we think! We have messed up our history, let's not mess up our future. After all, who wants to die because of humans only to be rescued by aliens!

This edition of the TORQUE magazine is carefully crafted to understand what we have on us as 'Neo Humans', our achievements and challenges. The blogs and articles have been carefully designed to provide a holistic picture of the Neo Revolution on which we are en route!

Technology has never failed to amaze us. I believe the young minds at IITGN, harness the power of technology to shatter the boundaries of knowledge.
Almost everything is achievable through technology now. Intelligence is not only the province of humans, but it has become a collaboration between humans and machines. This form of artificial intelligence has been suffused into our lives to decipher our complicated activities and behaviour. Maybe we are on the verge of a breakthrough or have barely made a scratch!

Nurturing the intelligence of machines for sure prove to be a reliable approach to understand humans and their capabilities. With the curiosity to discover never fading and the technology on our side, the impossible will soon be a speck of dust.

PROF. S. RAJENDRAN

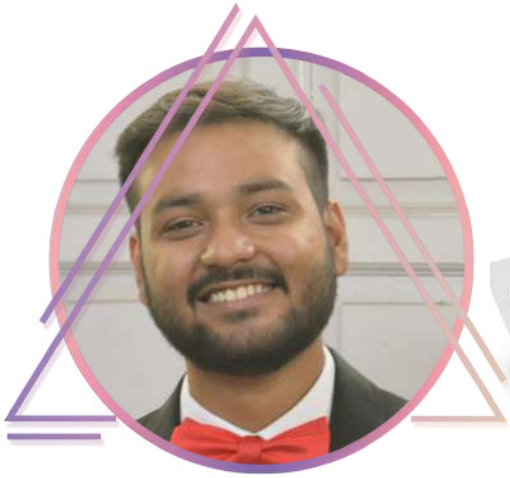
Faculty Advisor
Student Technical Council, 2019-2020

I feel extremely delighted to present before you what our previous Technical Secretary started in her tenure, the second edition of our college's very own technical magazine - TORQUE 2.0 with the aim to make the community aware about all the technical activities and initiatives that happen round the clock in our college.
Science and technology today is vastly more stimulating to the imagination than are the classics. Ever thought about the idea of reconstructing a human brain and acquiring "Artificial Intelligence"? No? Curious? Flip the pages and you'll know. Not just this but a lot more.
Trust me when I say it's a happy meal for your scientific tempo. Give it a try and you would not want to keep it down, all thanks to the most diverse and talented team we were fortunate enough to have for this!

Bon apprentissage!

PANKAJ VATWANI

Technical Secretary
Student Technical Council, 2019 2020



So, why are we here with the second edition of the TORQUE magazine? We thought it is time to clear the table and start a discussion about why are we calling you and us as 'Neo Humans'. As you flip through the pages, you will come to know about what makes you a neo human, are you a metahuman or a neo-human, the feats that we have achieved thanks to the advent of AI and also why should we care about ethics now that the future is nearer than we thought. It will also tell you about all the tech activities that were conducted in our college in the last year, progress made by the clubs and their upcoming plans. We have also featured names of winners of various competitions that were held. Some amazing brain-teasing facts complete as a cherry on the top for this edition.

We hope you find it exciting and engaging. As usual, our Design and Illustration team has done a commendable job to make this magazine look this amazing! Not to forget the rarest of the rare species that constitute our Editorial team (PS - It is hard to find technocrats who are also in creative writing and blogging!)

Even as Neo Humans, we are always looking for improvements. Do let us know your feedback and suggestions. Also, if you were expecting something in the magazine but it isn't, write to us at torque.iitgn@gmail.com.

What are you waiting for? Go ahead and feel the TORQUE!

ADESH KUSHWAHA
Editor-In-Chief
The Design and Illustration Team

DEEPIKA SONI
Editor-In-Chief
The Editorial Team

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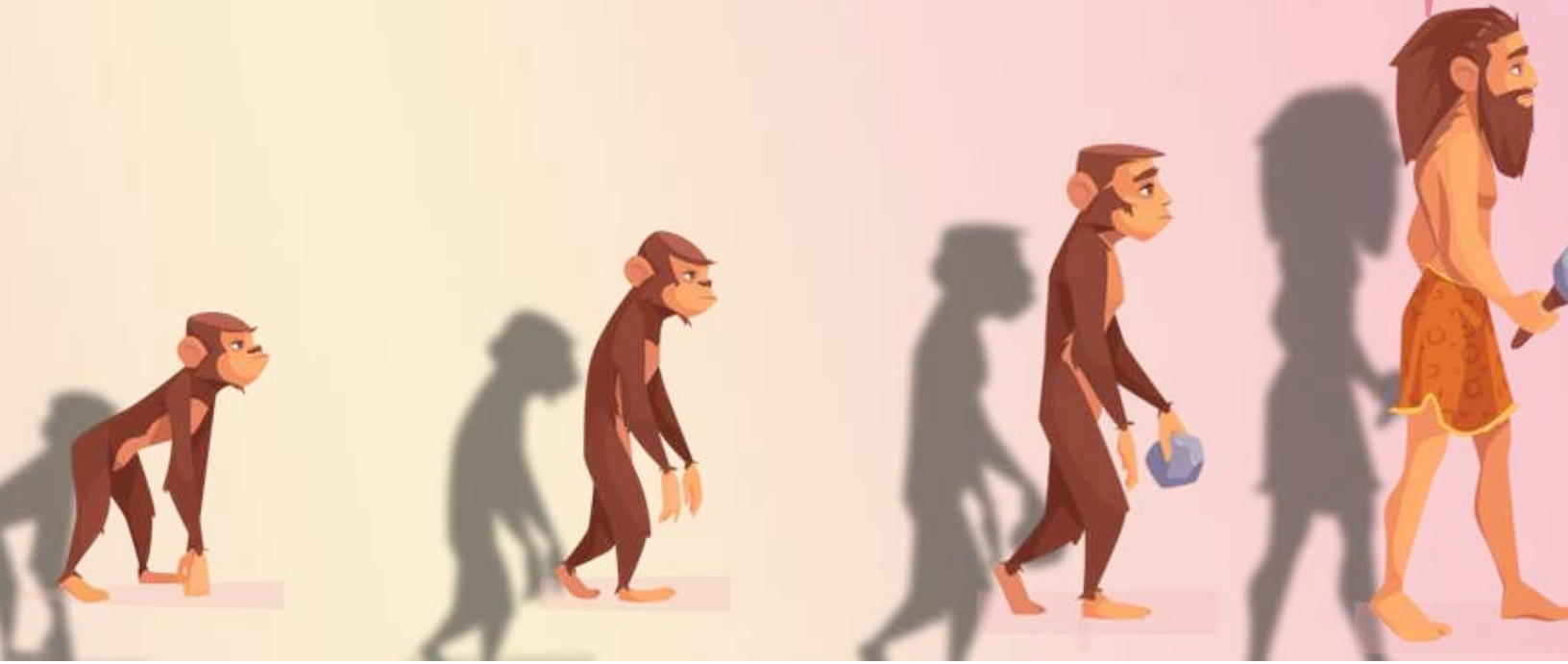
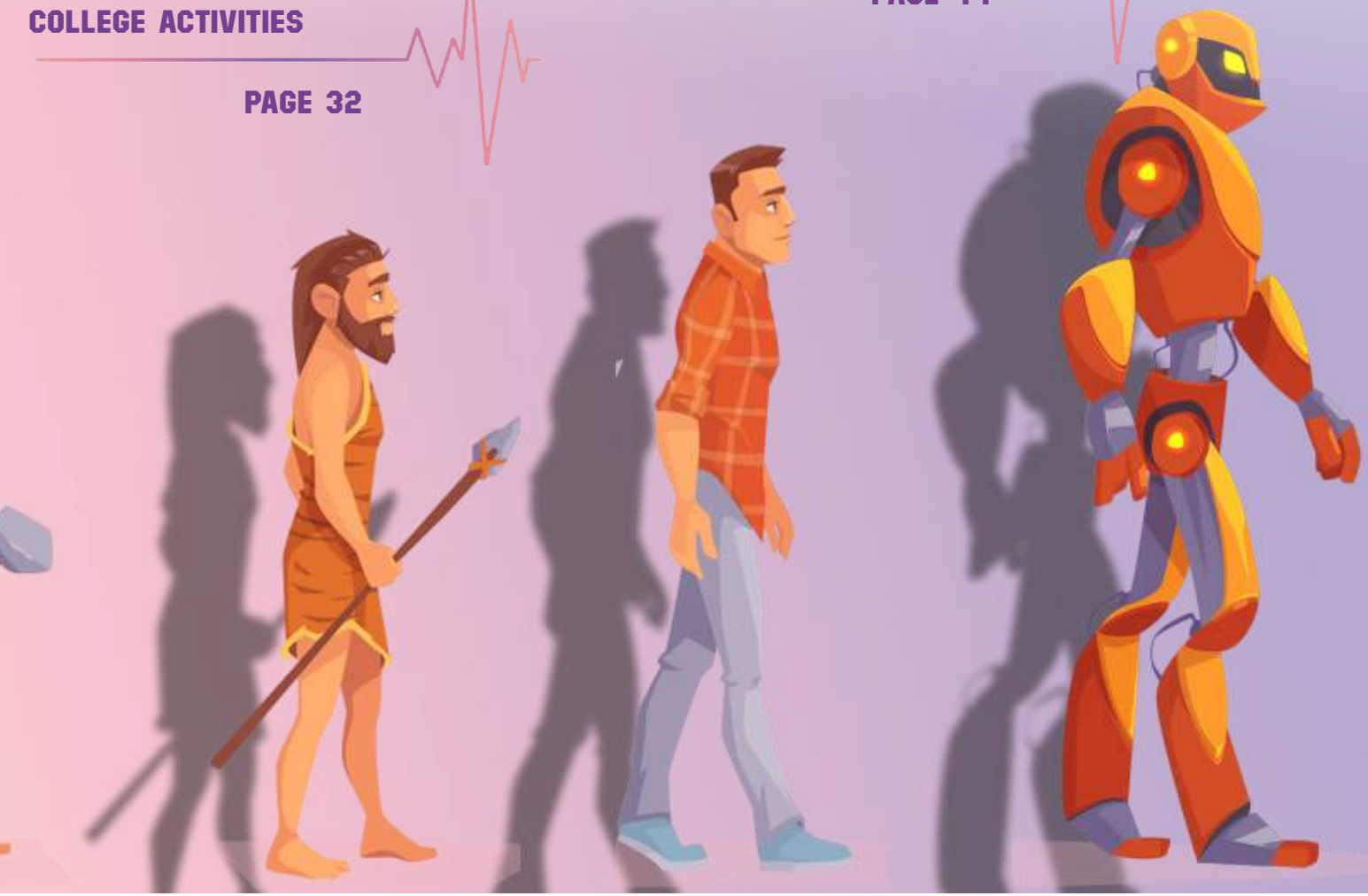




ADVANCES IN THE FIELD OF HUMAN ENHANCMENTS

I think we have all had our fair share of movies with futuristic visions of the human race; may it be telepathic communication, cybernetic body parts, or genetic enhancements, all of them share the common theme of a significant interference between the pacing fronts of biology and technology. In this edition of TORQUE, we plan on telling you just how into the 'future' we have come.

A decade ago, human enhancements would seem like concepts out of fictitious tales. With the turn of the decade came significant advances in the field of human augmentation. This research is mostly centred in the fields of Bionics & Prosthetics, Brain-Computer interfaces, Neurotechnology and Genetic engineering. Today, it is possible for an amputee to have a bionic part installed that would enable two-way communication between the brain and the part. This is a medical feat achieved by a team led by Dr Mathew Carty and Prof. Hugh Herr from MIT. The combination of a surgical amputation technique and a technological innovation (the bionic limb) made this idea come to life.

What makes this invention so important is its ability to restore the sense of proprioception (the ability to know without looking, where your limbs are in space, how fast they are moving, and with what force) in its users. In the "Ewing amputation", the limb recreates the closed-loop interactions between the brain and the muscles, by sewing together pairs of muscles and tendons that used to connect to the ankle and the subtalar joint in the foot. When one muscle contracts, the other stretches, restoring the sensation that the joint is moving. Electrodes attached to the patient's skin record the muscle movements in the residual limb and send signals to the prosthetic foot that cause it to move the way he/she feels like it is moving.

This is just one of the many attempts taking place in the field of bionics; others include robotic exoskeletons, artificial skin and many more . Though the motivation behind these innovations is not as much to enhance existing human capabilities instead restore them, the day is not far when one would be tempted to replace a limb with a bionic one.

Mean Mech Competition

The team comprising of Ishan Prayagi, Abhigyan Martin Ninama, Yash More emerged winners in the Mini Quest event held by Mean Mechanics where they worked on the project "Motion replicating car using an accelerometer".

The more critical form of augmentation would be between human thoughts and external devices. In other words, you could think of it and see it happening. Imagine looking up a fact on the internet while having a phone call with your friend, all happening inside your head. Brain-Computer Interfaces (BCIs) are paving the way for this vision. They promise to use 'brain waves' to control external devices. Just like the update from text-based interfaces to a Graphical User Interface (GUI, pronounced 'gooey'), BCIs promise quicker and more precise interactions. Soon, devices would be extensions of ourselves.

BCIs translate the electrical signals produced on an EEG to simple commands to the user's environment. Studies have shown BCIs that control prosthetic hands, wheelchairs or read off of a screen are based on the electrical signals obtained from microelectrode arrays implanted in significant parts of the brain (the primary cortex in this case).

Besides these reasonably prominent advancements, there is significant work going on in the field of genetic engineering. Attempts to study and write the genetic code of a human being are being made, and the underlying idea is simple- it is to identify specific genes that make a person either extraordinary, tall, smart, sick or a serial killer. With the enormous amount of data that would be required to hold onto this kind of genetic information, we could start curing diseases like cancer.
Whatever may be the enhancement, it looks like the future is almost here.

AMITHA RANI
B.Tech 3rd Year, Material Science and Engineering

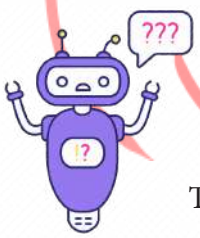
TELEPATHY THROUGH TECHNOLOGY

Do you know what am I thinking right now? Apart from how to articulate the next sentence of this article, what else am I thinking? Can a person A make out what the person standing in front, let's say B is thinking without any textual, vocal or gestured conversation with B? No, right? Telepathy is one of the supernatural powers, in which a person is able to understand the thoughts of another person without using any of the above means. Isn't it eerie?

In the 19th century, a mentalist, Washington Irving Bishop was able to correctly locate a hidden object by sensing neuro-motory changes in the muscles of a subject's hands who knew the correct location of the object. This is known as 'Muscle Reading', in which muscles subconsciously respond to what a person is thinking. Achieving the ability to perform telepathy opens doors to a different type of communication means.

Telepathy using technology is a possibility now. Accomplishing this would make a person a 'Cyborg', a human being with senses and powers superior to a normal human being because of technological extensions to the body. This was shown for the first time by Prof Kevin Warwick of Coventry University in the United Kingdom. Prof Warwick is known for his notorious experiments like implanting chips like RFID sensor into one of his arms. The RFID sensor implanted in the median nerve in the left arm through surgery is able to detect neuro-motor signals sparked by brain activities. Prof Warwick was able to control doors and other simple electronic devices like computer, lights, etc. using this implanted chip, through internet connectivity. The nervous system and the muscles responded to the brain. As he moved around, near his computer, it turned on automatically recognising the presence of the user. As a result of this experiment, Prof Warwick is claimed to be the first cyborg and is often known as 'Captain Cyborg'. Using the chip connected to the internet, Prof Warwick was able to train a robot sitting at another university.

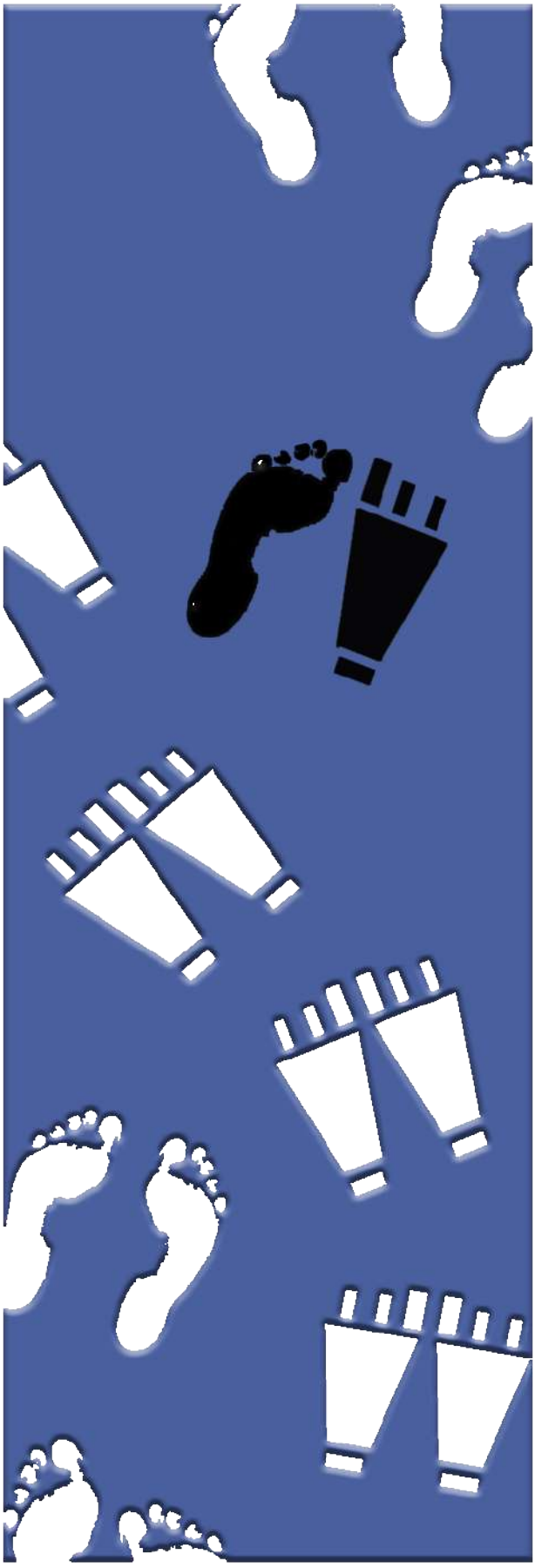
Nearly 86% of people plug in their USB wrong.



In another famous experiment, Prof Warwick implanted an array of thin electrodes into one of his arms, and a similar one into his wife's arm. The array of electrodes were connected to the internet. This was the first time when the nervous systems of two individuals were linked electronically. Arm movements performed by Prof Warwick's wife would be sensed by him. Implanting of electrodes into the nervous system was a critical step; its failure would have resulted in critical nervous breakdowns. Though the experiment was unable to transfer information directly from the brain, it has paved the way for telepathy through wireless technology.

The information in the brain is processed through electrical signals. If these electrical signals can be measured by any means, the thinking process of the person involved can be captured and analysed for any moment. One such technique is 'Electroencephalography' in which electrical activity of the brain is measured using small electrodes placed on the scalp. It is a non-invasive technique. The data is obtained from the electrodes in the form of electrical signals, the frequency of which depends upon the type of activity and can be processed and transferred wirelessly using the internet to the receiver. This receiver can be a human also, whose nervous system can be altered using electronics such that it is able to receive and comprehend signals from another being. The possibility of this is a hope for a tremendous change in the means we communicate, opening the gates for transhumanism. Telepathy can be made into a reality, with humans becoming super-powerful beings, just like the ones we see and admire in sci-fi movies.

ARPITA SANJAY KABRA
B.Tech 2nd Year, Electrical Engineering



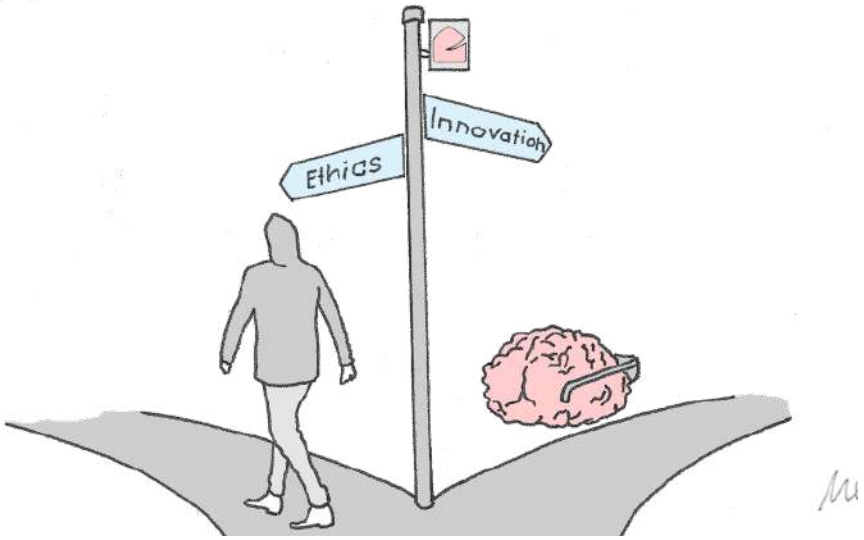
AS NEO HUMANS, WHY SHOULD WE CARE ABOUT ETHICS?

Today, we witness the advancement of technology at an unprecedented pace. Just a couple of generations ago, people were dying of common illnesses, and today, we have compelling tools to manipulate our minds and our bodies. We have brain-machine interfaces to produce movements through our thoughts; brain-brain interfaces which allow telepathic communication; gene editing which can alter the very constitution of our bodies, and many more enhancements that make us Neo-Humans. With this power, comes the crucial considerations of ethics and morality. Science, rationality and reason alone are insufficient to allow healthy functioning of a society. Above all logic, lies the morality of a decision and the ethical implications attached to it. A disregard for these, more often than not, leads to catastrophic outcomes.

With each new invention, the scientists must ask themselves the fundamental questions of ethics, but this is not as simple as seems. Morals are never black and white, nor are they fixed and static. A large grey area lies between the two ends of good and evil, heavily obscured by considerations of context, culture, history, values and several other things, all of which cannot be listed exhaustively. Morality and all the aspects attached to it are also continually evolving and are highly dynamic. Moreover, the same tool can be used in many ethical, unethical and

questionable ways. The complexity and nuance weigh heavily on the human mind, maybe overshadowed by selfish needs, and one ends up taking decisions which, at the very least, are contentious.

One landmark ethical controversy was the birth of gene-edited twins, Lulu and Nana. He Jiankui, a biophysics researcher at the Southern University of Science and Technology, China, recruited heterosexual couples who wanted to have children, where the man was HIV positive, and the woman was uninfected. Through in-vitro fertilization and the gene-editing tool CRISPR-Cas9, he attempted to create a genetic mutation in the embryo, expected to confer resistance from HIV. The experiments were conducted in secrecy, ethical approval documents were allegedly forged, and it remains questionable whether the consent of the parents was genuinely informed. Twin girls, reportedly healthy, pseudo-named Lulu and Nana, were born in October 2018. It was reportedly verified that the gene surgery was successful and the experiment was made public the following month. The experiment was regarded to be extremely premature and was widely condemned by the scientific community citing the well being of the twins. This led Chinese authorities to propose the drafting of regulations and penalties regarding human gene editing, and the World Health Organisation to introduce a global database of gene editing research and prohibiting genetic alteration in human clinical trials. As of 2019, Mr He has been fired from the university and may face serious consequences.



Incidents like these force one to face critical ethical questions. The pursuit of conferring resistance to HIV is a moral one, but experimenting on humans, at a time when scientific knowledge regarding the human genome is extremely insufficient, is conscious negligence which could potentially lead to several unfortunate outcomes including manslaughter. When facing ethical dilemmas, general guidelines are unlikely to prove sufficient and specific ethical challenges need to be intensely deliberated upon within the community. A broad consensus might be the right way towards resolution; however, this is not foolproof either. The best way to face these challenges is a challenge.

A need for regulatory bodies is also being realized for novel technologies. Transparency, as well as tracking of research, is vital to avoid the intentional unethical use of powerful technology for individual or national interests. The inculcation of ethical values into a system high on power and fame is also a challenge we need to address. Power corrupts; combined with freedom, can lead to tragedy. Imposing restrictions to keep institutions of power in check, as well as instilling a desirable moral compass at the fundamental level will prevent the calamities powerful technology has the potential to bring upon us.

EKTA KHEMCHANDANI
M.Sc 2nd Year, Cognitive Science

COMIC REVIEW

"My name is Barry Allen… I am the fastest man alive!"

Almost felt nostalgic and travelling back to the childhood days for a second to feel the excitement and thrill that we felt with the comic books in our hands? It is amazing how we connect ourselves to some of the fictional characters as kids and dive deep into the world of superheroes and metahumans. We do not just connect to these characters due to childish fantasies. We do so because they are so reasonably built and developed.

My personal favourite comic book character is 'The Flash'. I loved reading its comics while growing up. The Flash tells the story of Barry Allen, a forensic scientist who works with the Central City Police Department. He was bullied as a child, and often taken on due to being slow and lazy. Nevertheless, he was happy as his parents loved him very much. One day, he woke up from his sleep due to some noises downstairs. He went down, and what he saw changed his life forever. He saw his mother surrounded by a very fast-moving yellow wind, or rather a blur, and inside that blur, he saw a man. He saw the impossible- a man moving faster than wind. His mother was in danger, and before he could understand anything about what he saw, he found himself outside on the street, carried by a similar but red-coloured wind.

When he ran his way back to his home, he found out that his mother murdered, and the police had taken his father into custody for the crime. He spent his whole childhood and teenage years trying to find out what happened that night, trying to prove his father innocent. Now a young adult, Barry is happy with his job and has fallen for Iris West, a news reporter. However, he still has not gotten over his past, with his father in jail.

There is a science facility in Central City known as S.T.A.R Labs, headed by a brilliant scientist Dr Harrison Wells. He has worked on building a particle accelerator for six years and is now finally ready to test it. On the night when the particle accelerator is switched on, there is a storm which causes a malfunction of the primary cooling systems. The electron volts become uncontrollable, and energy from the detonation is thrown into the sky, which creates a bolt of lightning. This lightning bolt strikes Barry, and he is thrown onto certain chemicals which mix with his blood and react, while the lightning surge is still inside his body.

Nine months later, Barry Allen wakes up at S.T.A.R. Labs where he is told that he was taken care of by scientists there for the last nine months, as his condition was too complex to be understood by doctors. His muscles should have been in a state of atrophy, but instead, they were in a state of constant regeneration and repair. Soon Barry

learns that the 'flash' of the lightning changed him, and he can achieve great speeds that are beyond human comprehension.

Barry decides to use his skills to fight crime and save Central City from evil metahumans who were formed due to the dark matter released from the particle accelerator explosion. He starts as the "Red Streak" or the "Scarlett Speedster", but ultimately is given the title "Flash", the fastest man alive! He uses his speed and other enhanced skills to solve the mystery of his mother's death and to prove the innocence of his father.

The beautiful thing that I wanted to bring out is how the concept of "Metahumans" in the Flash comics relates so much to the present day scenario with Neo Humans. Flash defines metahumans as individuals who acquired superhuman powers or extraordinary gifts after being hit with the wave of dark matter released from the particle accelerator explosion. The dark matter changed their DNA and genetic structure, which can be roughly scaled down to mutation in biological terms. This is almost the exact concept behind Neo Humans. Neo Humans can be defined as humans with "extraordinary gifts" or "enhanced abilities". We are trying our level best to instil modifications in the human body that increase our abilities, and we are not very far from creating a cyborg or a "Metahuman", one day, we might even create a 'Flash' deliberately!

"My name is Barry Allen…
I am the fastest man alive!"

It may sound absurd that we can create someone with abilities like Flash. However, it is not something unachievable. A fifty years ago, would anyone even in their wildest dreams could have thought it was possible to create a humanoid who could talk like humans, interact like them and even think on their own-which is a reality today. Maybe 50 years from now space travels and time travels might be possible. Who knows the advancements also transform us from humans to metahumans?

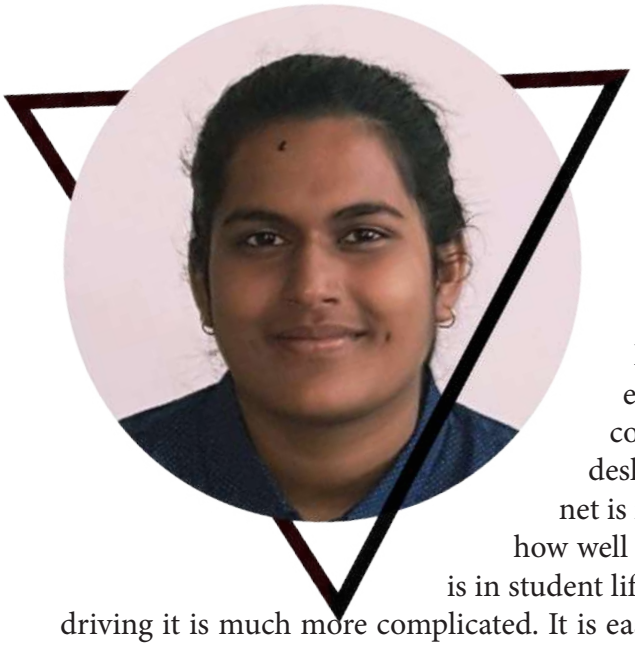
Growing up, I realized how scientifically accurate and reasonable the comics was because now I could understand and imagine better. The following instance is still one of my favourites from the comic. A metahuman who goes by the name Weather Wizard has attacked Central City. He has raised a tsunami that is going to strike Central City. Barry tells Iris that he loves her before Dr Wells tells him the way to stop the tsunami, which is by running back and forth along the coast at such high speed that he can create a wall of wind that can contain the tidal wave. For that, he needs to run at such high speeds that he has never achieved before. And he does- he runs faster than ever before. Now there is a twist. Barry opens a wormhole in space, and he travels back in time- which is perfectly following the principle of relativity. Barry later also uses time travel to travel back to the night his mother was murdered, and he finds out that the yellow wind was the 'Reverse Flash', his arch enemy and the red wind- that was Barry himself! The Flash from the future!

I want to conclude with a vision of what the world could be like tomorrow. We are moving closer to becoming Neo versions of ourselves day by day. Fighting cancer or HLH is not a very difficult ordeal anymore, Not denying the fact that technology can be the most dangerous thing if not dealt with correctly. We cannot completely eradicate the possibility of experiments going wrong and the dark side of "neo humanism". What should we do? Should we not delve into neo humanism at all due to the possibility of it all going wrong?

Comic books have given us the answer to this question. In a world full of possibilities, some things and elements are a misfit, that should not be there- but there is also hope. That the good shall outweigh the bad. The comics have showed this balance for so long. There are evil metahumans, but there are also heroes and good metahumans. So let us hope for the best, and work towards a better future. The great Dr Harrison Wells himself said," Trust me, that future will be here much faster than you think!"

AYUSH ANAND
B.Tech 1st Year, Computer Science and Engineering

ALUMNI SERIES



RUSHALI SAXENA
TECHNICAL SECRETARY 2018-19

"Today, it is the ease and efficiency of technology that has enabled me to share the content within minutes across to the team who is compiling this magazine. I came to appreciate the role of the Internet more after joining my current role in an Investment Bank. Financial markets are renowned for their split-second surprises. Keeping adept with what is happening is even more crucial. I can communicate and collaborate with global projects involving trading desks across London, Hong Kong and Japan. I am aware that the Internet is not something new to the readers. I am emphasizing on it is because how well we use it is something that needs pondering, the best time to do so is in student life. Because the world outside the campus is much bigger, technology driving it is much more complicated. It is easy to get lost in this big world, despite having Google Maps at your service. The basics of tech remain the same: find a problem and a solution and keep learning with an open mind."

DINESH BORSE
TECHNICAL SECRETARY 2017-18

"Stay hungry to learn…

There are numerous opportunities located on the campus to improve your technical skills, validate the potential of an entrepreneurial idea, or have some tinkering experience. Throughout my Btech years, I was thrilled to work in the Technical Council. I was the Technical Secretary of the year 2017-18 and Secretary of Mean Mechanics club for 2016-17. The time at the council taught me some of the valuable lessons of my life. I have a higher number of failed projects to my name compared to the successful once. But I feel what matters is the learnings that I received from it. Apart from gaining technical knowledge, I become capable of analyzing myself and formulating the right decisions in the worst of the situations. As technology is changing at an increasing pace, it has generated a need to be adaptive to the new approach and to focus on learning how to learn.

I have been following TORQUE, and it's activities on Facebook and other social media platforms. It gives me immense pride to see the progress of the Student Technical Council in such diverse fields with equal intensity. Keep up the excellent work, and I am sure you guys will make us and the institute proud."

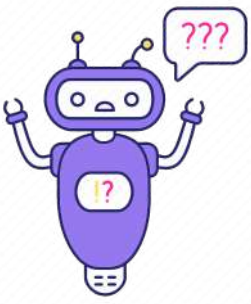
CHITRANSHU KUMAR
TECHNICAL SECRETARY 2014-15

"I am currently pursuing my Master of Design in Product Design at National Institute of Design, Ahmedabad. It has been an enriching opportunity that cleared a path towards career interests which I wish to take forward. I was fortunate enough to be part of several projects at IIT Gandhinagar, which gave me a boost of confidence in converting the technology I'm taught, to user-friendly, socially aware and practical products.

My experience as a Technical Secretary of the institute taught me how to manage different people of varying backgrounds. It also disciplined my routine further helping me to juggle both academics and extracurricular activities. The experience led to the exchange of interdisciplinary skills and knowledge that has become a valuable asset.

My four-year journey and being part of the alumni community has led me to various fruitful networks and collaborations. I wish the same and more to the current and future students of IIT-Gandhinagar.

Congratulations and best wishes to all the members of the Technical Council for the hard work and continuous efforts in maintaining the technical culture and achieving new heights. "



Google Maps calculates traffic by tracking how fast android devices are moving on the road.

Third Position in SVNIT AIChE Chem-e-car competition:
IITGN Chem-e-car team participated in SVNIT Chem-e-Car competition. The team performed well and secured the third position for the college.
The team members were:

Aslam Mohmmad
Souritra Garai
Arpit Kaushal
Akshat Mangal
Parichay Thakore

KNOW YOUR PROFESSOR

UTTAMA LAHIRI
Associate Professor
Electrical Engineering

1.Can you briefly explain what you work on and how it is relevant to the theme of our magazine,'Neo Humans'?
I work mostly in two areas- one is Rehab, and the other is Intervention. As far as Rehab is concerned, I mostly work with full stroke patients, particularly gait rehabilitation and upper limb movement rehabilitation, and also of late, I have started working with Parkinson's patients in the area of gait. As far as Intervention is concerned, I work with children with autism, mostly in the social communication domain. In this process, I use signal and image processing techniques. Decision-making blocks are mostly AI-driven. I also use a lot of Machine Learning for my work. So in one case, I use physiology to predict affective states such as engagement, anxiety, etc. In another case, I use physiology to predict states such as the stress level of a patient going through a physical exercise, and then try to give them different challenge levels so that they can excitingly do the exercise. When I say 'interesting', it is mostly virtual reality. I design VR based interfaces. I design games for children with autism and for patients who, if they are walking, can see some changes in a virtual environment. Such as an avatar walking whose gait is synchronized with that of the walker's walk, and we develop closed-loop physiology driven, adaptive, intelligent systems and that is how the name of our lab is 'Intelligent Rehabilitation Affective Computing Systems Lab.'

2. You love helping kids with autism, and you study their stress levels for the same. How do you sense someone's stress levels or look at their verbal communication patterns? How do you transfer their emotional, auditory or physical stimuli to the affective states?
I consider it as a Machine Learning algorithm. At the heart of it, there is an AI engine which looks for specific inputs and outputs. The inputs can be the child's behaviour, in terms of gesture, posture, and also the person's behavioural looking pattern. The first aspect would be where the child is looking, for how long, and how fast the child is changing their gaze from one point to the other. The other aspect is to look at muscle relaxation, heart rate, sweating patterns etc. All of these become inputs to my system and then based on the inputs, I train my system against predefined targets.
Say a therapist says that the child is anxious or tense; from those affective states I try to map physiological states. So if a child's heart rate is going up, or if their pupils are dilated, it means that the child is anxious. There is excellent research out there which already predicts how the child's facility is changing based on the stress level. This is the mapping I do by using different types of ML-based unsupervised learning or in some cases, very supervised learning, like a support vector machine, neural networks or fuzzy engines. One of our work with is where we developed predictive models based on the physiological state or the behaviour of the manifestations, and then we map it to the anxiety engagement or stress level and then do a closed-loop control.

3. Is there something that physically goes on to a child, for example, sensors?

When I am looking for patterns, I have cameras. The child is playing on the computer and a computer camera already there. Sometimes we use external cameras, sometimes we use internal cameras. The internal camera looks towards the child's eyes, and we use image processing to extract information, particularly the pupillary moment. We try to map it against the computer screen where an avatar is looking intently towards the child. Like, if I am speaking to you, I would be looking straight at you, but children with autism, if they look straight, they become tense. So what the avatar does to teach him /her communication skills is to match its looking pattern to that of the child. By the avatar, I mean the AI engine. After a while, when the child starts communicating, the avatar goes back to the regular human-looking pattern, and so does the child. We have experience of working with different children and different cases in Ahmedabad. We have seen them tremble when their names were called out. However, today, these children, after going through the process, can perform on stage. We have had very fulfilling and satisfactory results.

4. Would you say that is the favourite aspect of this research?

I do want to produce papers and publications, but more importantly, I keep asking myself, 'does this touch the lives of a common human being?'. So for me when I see a child with autism, coming to me, holding me or performing on stage, that is a different feeling altogether. Even when it comes to stroke patients, we have seen patients come to us with their children holding them after nine to twelve exposures to our system, which is a search-driven, adaptive intelligent system. These are patients who were not able to walk or even cross the road post their stroke. When I talk to those patients and how something we have developed in the lab is changing their lives and giving them confidence in themselves, I think that is the most rewarding feeling I could gain from this research.

5. What spurred you to do this research?

I always had the intention to do something for society. Also, I had a special intention to go into the healthcare domain. I had a desire to work in there because we find clinical and technical domains as two separate domains. Nobody merges the two. Clinicians do not understand an engineer's language and vice versa, so the patients suffer. My goal was to bridge these two domains. I know some basic requirements in healthcare, and I took those as my problem statements. And then I thought about how can we address those problems. When I went for my research, I had two different topics given, one was for robotic surgery, and the other was for children with autism. Somehow the latter became much more appealing to me, and I took it up.

6. What has been your most important scientific finding?

We have got quite some patents with our findings in this lab. I think the most fulfilling part is that my students are a part of it. Furthermore, I know in future, they will come up with several more breakthroughs. I sowed the seed in them and in all these patients. I work so closely with my students everywhere. I have a group of people working together, and all of them are my students mostly. So for me, the fulfilling part is to sow a seed of research interest in your students.

7. What is the kind of response you have got for your research? How does it go out into the world?

I already started this process, where we are going for market translation of our research. Now we are planning to go for not just clinical trials, rather beyond that. We are trying to get it done with the industry so that it goes out to the market as a product. At this stage, I am hiring designers, industrial designers who can design special shoes for me. I want to make it a sort of a smart shoe and give it a unique design. Because it needs good aesthetics to be marketable, it has to look appealing and affordable. Then it can go out in the market, which I have already done with one of my products.

KNOW YOUR PROFESSOR

VINEET VASHISTA

Assistant Professor
Mechanical Engineering

1. What is your primary work domain, and how can we relate and connect it with our theme, 'Neo Humans'.

My main research area is Human-Centred Robotics. My background and training are in Mechanical Engineering, but the way I have evolved - my research- is kind of working with the humans, as well as robots, and seeing if we can use robotic systems for human movement and training. Suppose, an individual undergoes a stroke and loses a part of his/her limb movement. We can create grippings, based on their level of ability, that can assist them. If their arms are not working, an exoskeleton bone can be fixed around it. One can tune the control architecture of that system such that it trains more or less like a physical therapist.

It is some sort of enhancement to the human body, for example getting the function of the lost body part back, which resonates with the idea of your very theme. The other aspect is visualizing augmentation of skills, i.e. training to do a particular movement/ task better. Take an example of playing golf- human limbs have extra degrees of freedom, so the robotic systems can assist in training to perform these activities better. Humans are the centre, and then we create these robotic systems around them so that their performance is restored or enhanced.

2. You took the golf example. Can we program the machine to shoot the 'perfect' golf shot by attaching the machine to the human limb?

This is, in a way, guiding the movement. The robot is useless until it is attached to the human. When we combine a human and a robot, it becomes a system. We do not perceive the robot to be kind of humanoid or something which can execute all. We can attach different segments of the robot to the human, and then the coupled system performs the task in a much superior manner.

3. Recently, your lab made something for stroke recovery patients. Could you tell us more about it?

Right now we are working on leg exoskeleton which is powered.

4. Does it help the person move their arms in all directions of freedom?

Yes. We are conceptualizing it is as a variable system. One can wear it -like shorts where there are a couple of actuation points for application of external force which helps in moving the limbs. When we move our limb, it starts to improvise alongside. That is why we call it a Leg Exoskeleton because it is an external skeleton system.

6. Tell us about your mission behind researching on these topics? What made you pursue these and not others?

It started with some craze while working with robotic platforms. I tried to understand the mechanical aspect to control these platforms through reading and developing preliminary systems. I came across Neville Hogan, a very renowned MIT professor who works in the same domain. In the 1980s, he published a paper claiming that a mass-spring or a damper can perceive any mechanical system. This got me interested. My son is just ten months old, and he is learning to walk. I observed him and connected my observations with Neville's claim. We use our hands to support the kids when they start. If they are falling, we apply the necessary force until we feel they are stable enough. We remove our hands very subtly.

Imagining that our hands are kind of like a mechanical system, and the kid requires assistance or training to perform a task. That is how I thought of leg exoskeletons. Literature defines them as large systems that should be able to apply enough force to take our weight. However, the challenge is that these are only being mechanical systems and the human-robot interaction is not being improvised. There is a level of understanding when we apply force to a kid while walking or how a physiotherapist works. Therefore, I started to work on bringing this element of 'understanding.'

During my PhD, I thought of using flexible cables. We worked on a robotic platform with a series of patient groups like stroke patients and cerebral palsy kids. Now, we are using cable-driven systems and cable-driven robots to create exoskeletons. The idea is to have a variable, flexible system, capable of applying a force, keeping in mind the anatomy and requirement, helping just like a human.

7. When this was used on real patients, what was the response? Moreover, which part of the body was focused?

I have worked with stroke patients, cerebral palsy kids, and even older people.The pelvis was the main focus and also looking on the gait. The stroke patients have asymmetric gait and also several significant abnormalities due to which they typically tend not to use one of their leg. That is called the paralytic or the affected limb. The idea was to use the affected limb with the exoskeletons. The experiment was conducted with ten stroke patients, and the results showed that our solution improved the usage of the affected limb effectively. In a second study, we worked with cerebral palsy kids, and it was a six weeks long experimental protocol. The results showed improvement in their walking performance.

8. What do you enjoy the most about your work?

Earlier as a student, I used to be very excited about implementing the central control architecture and testing its correct working. There are exciting aspects. For example, when we are using a cable, we can only apply a pulling force, but a rod can apply a pushing force as well. This makes cables challenging to control because they are eventually connected with a motor. If the motor starts rolling in the other direction, it will create a failure. So, building a control logic was tricky but also exciting.

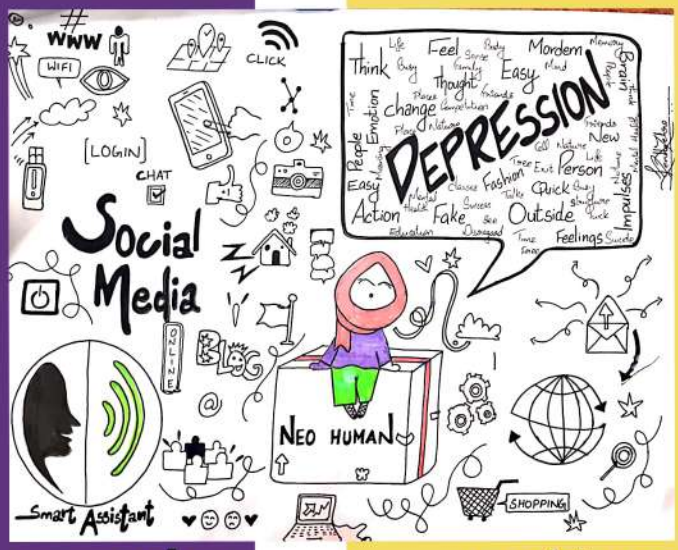
Now I find reading architectures and proposing new solutions to be very exciting. Also, interacting with my students gives me different perspectives to think on. Right now, three to four experiments are going on in the lab, which we are very excited to work on. This is my daily fuel now.

9. Do you have an end goal and a vision for your research?

The primary aspect we are working on is to improve human performance using technology. As of now, we are focusing on the lower limb. It has been a journey of a couple of years, but there is still some time before we come up with a system. If students are interested, we can also initiate some startups to install these in nursing homes and clinics. The other aspect is to understand how well we perform our movement tasks. Footballers, Tennis players efficiently use their muscles and limbs, and that is why they can perform the required movements with such precision. The train their muscles and make them learn. This is what I am currently curious to explore -about training the robots to learn themselves and improvise. As technology improves, this may be possible and can help a novice to become a professional!

The way our human-centred approach is going so far, we have seen a positive trend ad people are accepting this chain of thought. Hopefully down the line, there is some significant progress coming in.

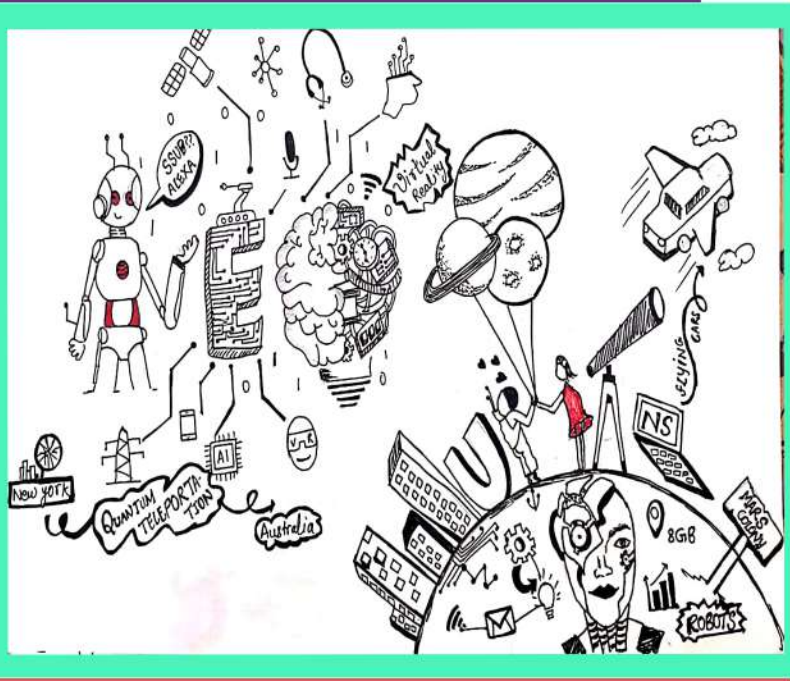
sanjukta manna, m.a. society and culture



renna zehra, m.a 1st year

janvi thakkar,

#2

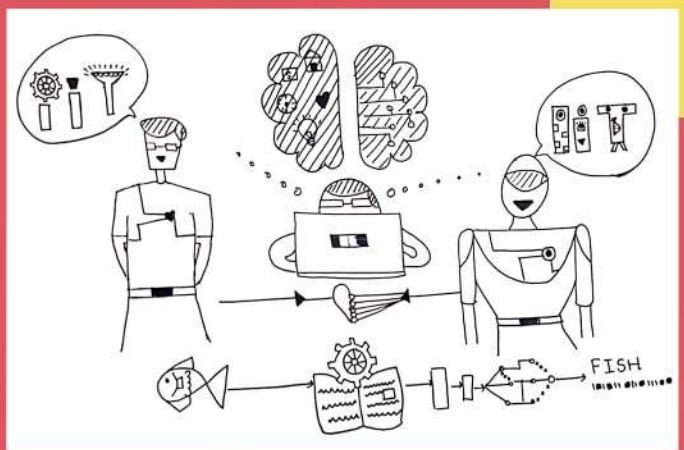


jayesthi mali, m.sc 1st year, physics

DOOD
ART COMP

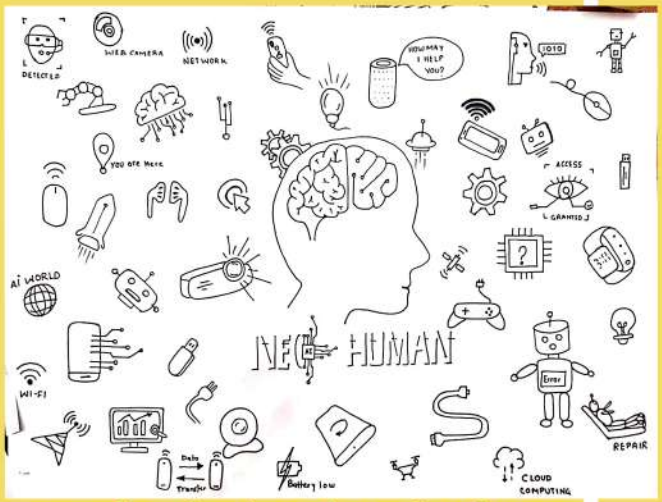
#1

suyash patidar, b.te



videsha bansal

b.tech 2nd year

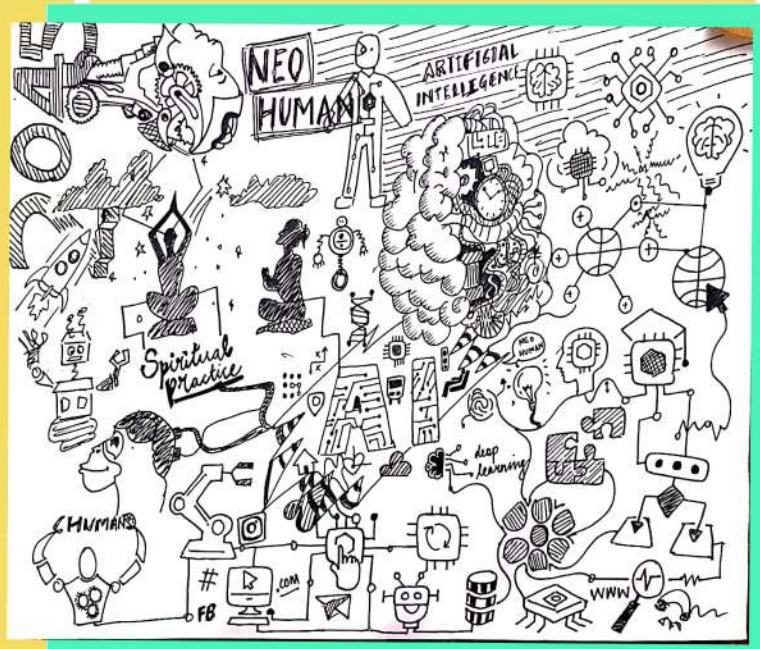


monika chouhan, b.tech 4th year

aakriti bansal

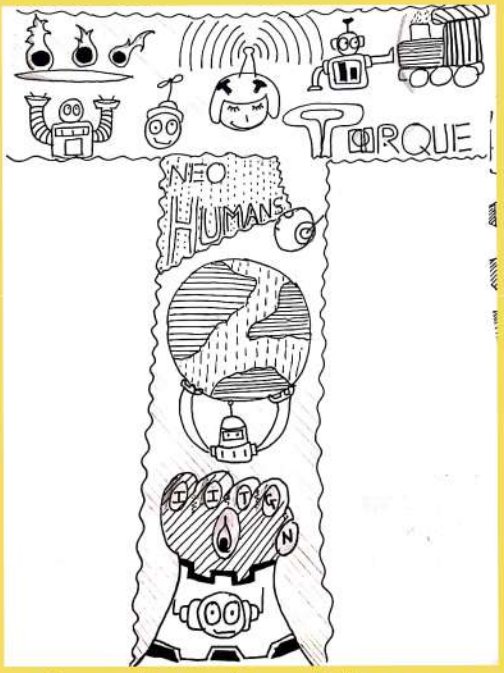
DLE
PETITION

#3



rahul patel, b.tech 2nd year

ch 4th year

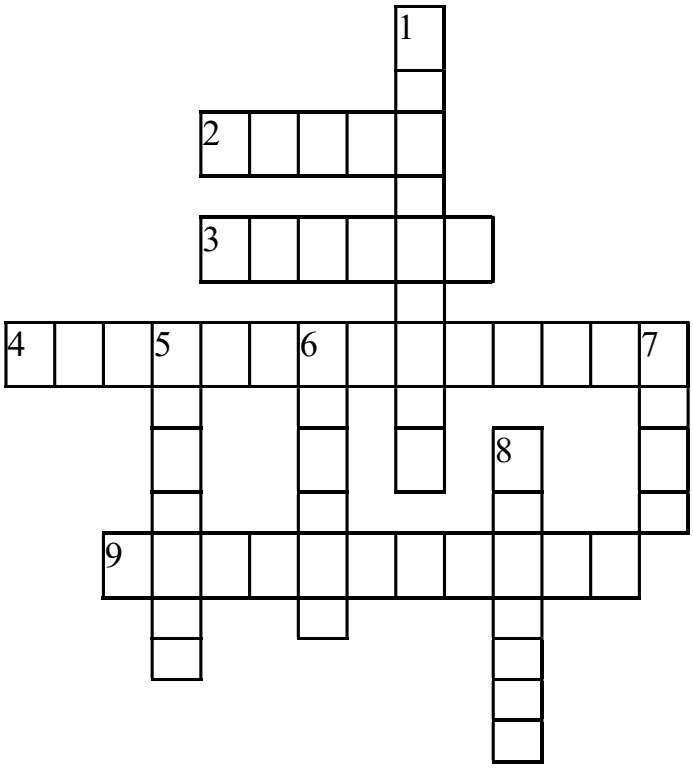


deep dave, b.tech 1st year

PALETTE
THE ART CLUB

In Association with Palette on 2nd November 2019

CROSSWORD



ACROSS

2. One method of controlling oil spills, which is being used in the wake of the incident in the Bay of Biscay, is essentially scooping up the oil from the water's surface. This is done using equipment called _____, which act like a barrier to prevent the oil from spreading.

3. Most-preferred language for android development

4. Developer of open source python programming language

9. World's first umbrella drone is named as

DOWN

1. First Black hole image was found in the center of which galaxy

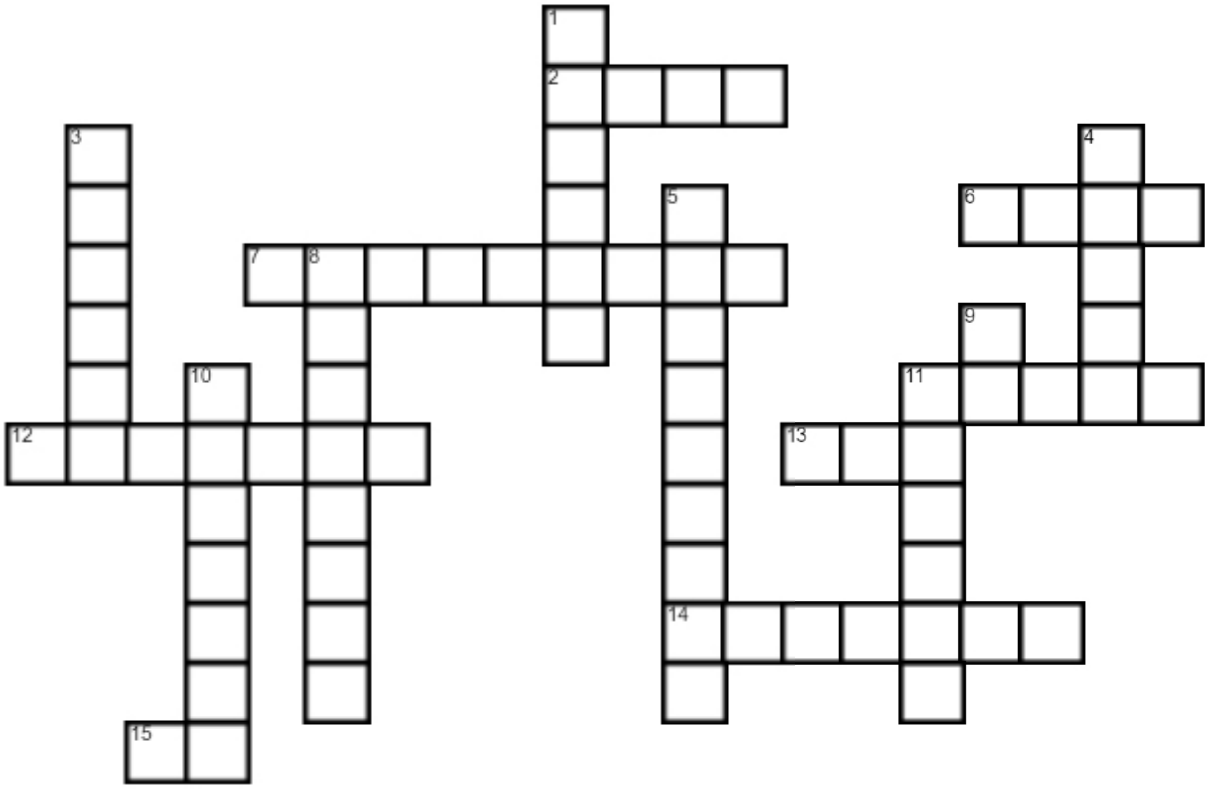
5. It rains _____ on Jupiter

6. A type of malware that automatically displays unwanted advertisements. Clicking on one of these ads would redirect you to malicious sites.

7. The _____ moves 3.8 cm away from the earth in 31536000 seconds

8. First metro station in India

CROSSWORD



ACROSS

2. Earlier named PC's Unlimited.

6. Made the famous walkman.

7. This company was the owner of Universal Studios from 1990 to 1995.

11. Was the first company to make coloured garages.

12. Its corporate statement is 'Inspire the Next'.

13. Provided computers in the Apollo Missions.

14. This company made a 10 billion dollar investment in Wisconsin.

15. Formed right after the Korean war to push the country's economy.

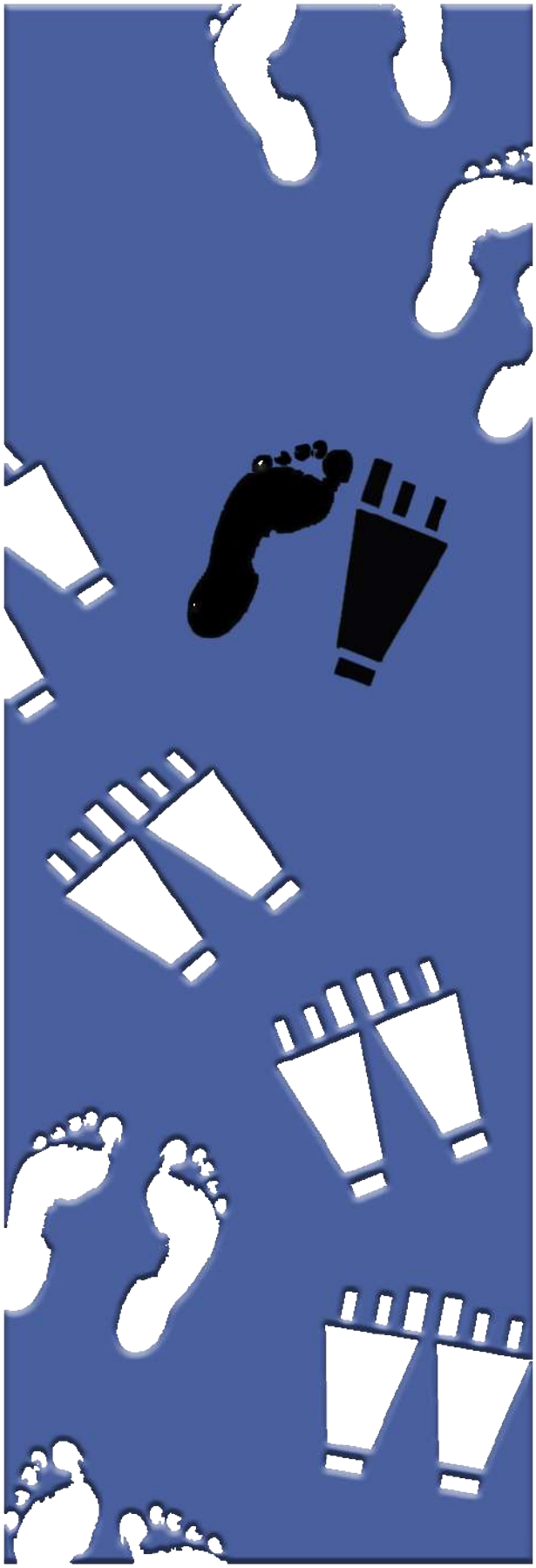
DOWN

1. The only Chinese company in the top 10 IT companies in the world.

3. The Chinese translation of this company means Chinese Achievement

4. The company helped Silicon Valley get its name.

5. The co-founder of this company was at that time the youngest billionaire.



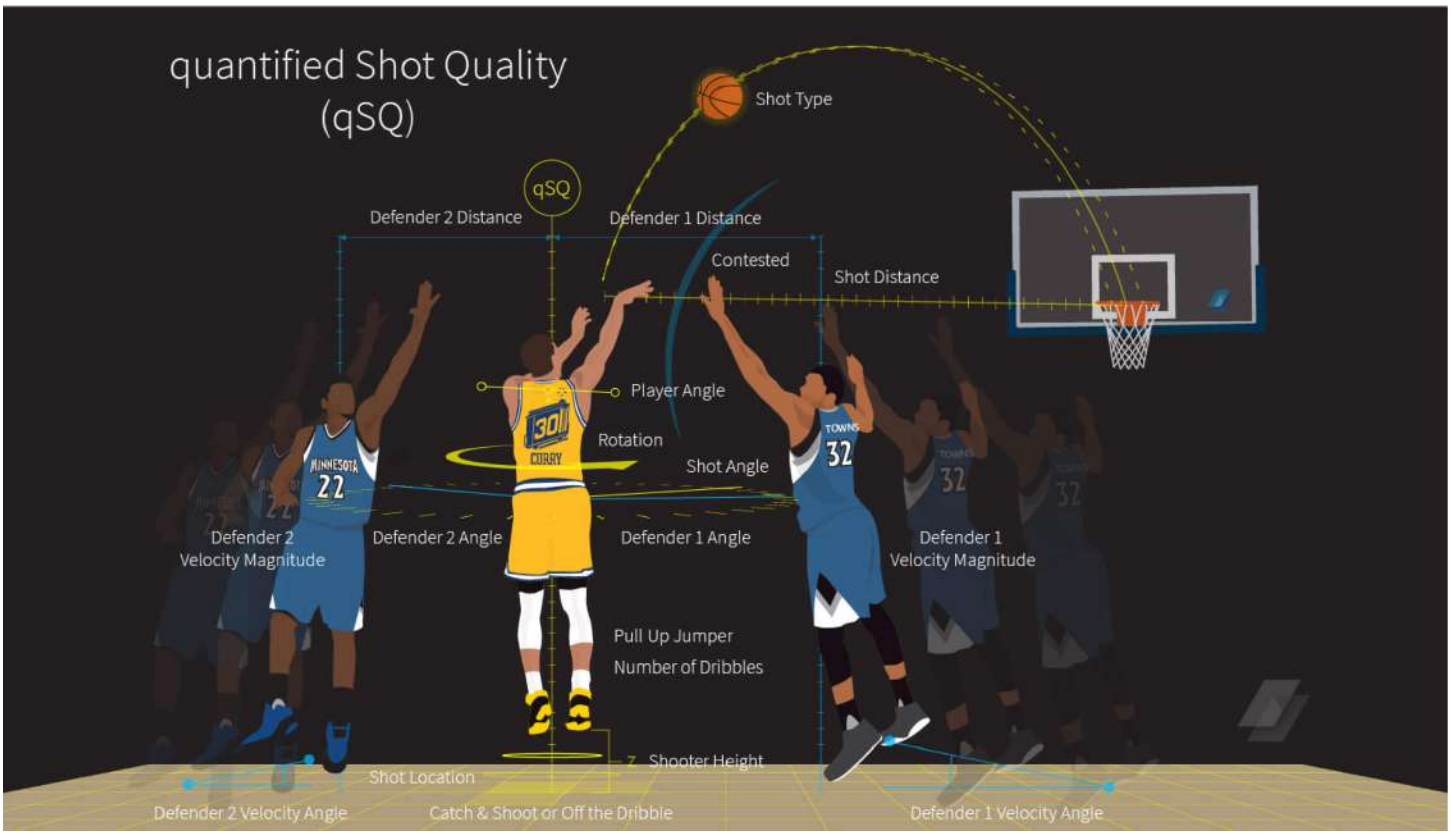
REDEFINING HUMAN LIMITS IN SPORTS WITH AI

The world of sports is continuously evolving; technology and investments have transported the game into an era of flawlessness and extreme dedication. Each movement that a player makes has to bring out the best of their ability. This drive for perfection has led to the breaking of records at an incredibly fast pace.

Post-performance analysis is a vital tool for the development of players, now being employed in practice as well. It provides essential data about the athlete and the team. Statistics are vital in team sports. Traditional sports statistics do very little in identifying the playing style- they focus on stats such as points scored, assists and goals conceded. Network science is a valuable tool in advanced analysis in sports and is the new game-changer. The raw data used for analysis consists of the motion of the players and the ball which is recorded with the help of overhead cameras or through wearables.

A study was conducted to uncover the secrets of one of football's best teams, Pep Guardiola's 2009-10 Barcelona. It analyzed all the matches in the 2009-10 La Liga season. Each player is considered a node, and when a pass is completed, forms a link. The link strengthens with more passes. The position of the player after each pass is noted and thus, a network is formed. The team analyzed a network of 50 passes as the game progressed, with each new pass the first pass in the network is removed. The result was that the centroid of a team or its average position is highest up the pitch for Barcelona. Only Real Madrid overtakes them in the final moments of the game. Barcelona has the lowest average passing distance, and they

tend to pass more horizontally. The study revealed that Barcelona showed the highest dependence on a single player, that player being Xavi. The analysis also showed that Barcelona's weakest point was when the players were furthest from the centroid, this is not universally true, Valencia, on the other hand, are at their best when their dispersion is high.



Second Spectrum Inc. provides a similar service to NBA and EPL teams. It analyzes each NBA player and notes down their stats. These range from simple things like points per shot to complex notions like a pick and roll that they had to train their system to learn, with the help of machine learning and thousands of pick and roll examples. The system should be able to identify parameters that define a pick and roll. Coaches and players can use this information to strengthen their play, for example, Steph Curry scores 1.09 points per shot which is much higher than the league average of 1.027; thus defences are required to pay more attention to him. VR is now being used in the NBA to assist the mental aspect of training, Washington Wizards reserve centre Ian Mahinmi went from a 61% shooter to a 70% shooter after just one season. VR allows us to mimic the tension and anxiety that we experience when playing in front of a large crowd during our practice sessions. Thus stats also allow us to estimate the success of a new training method.

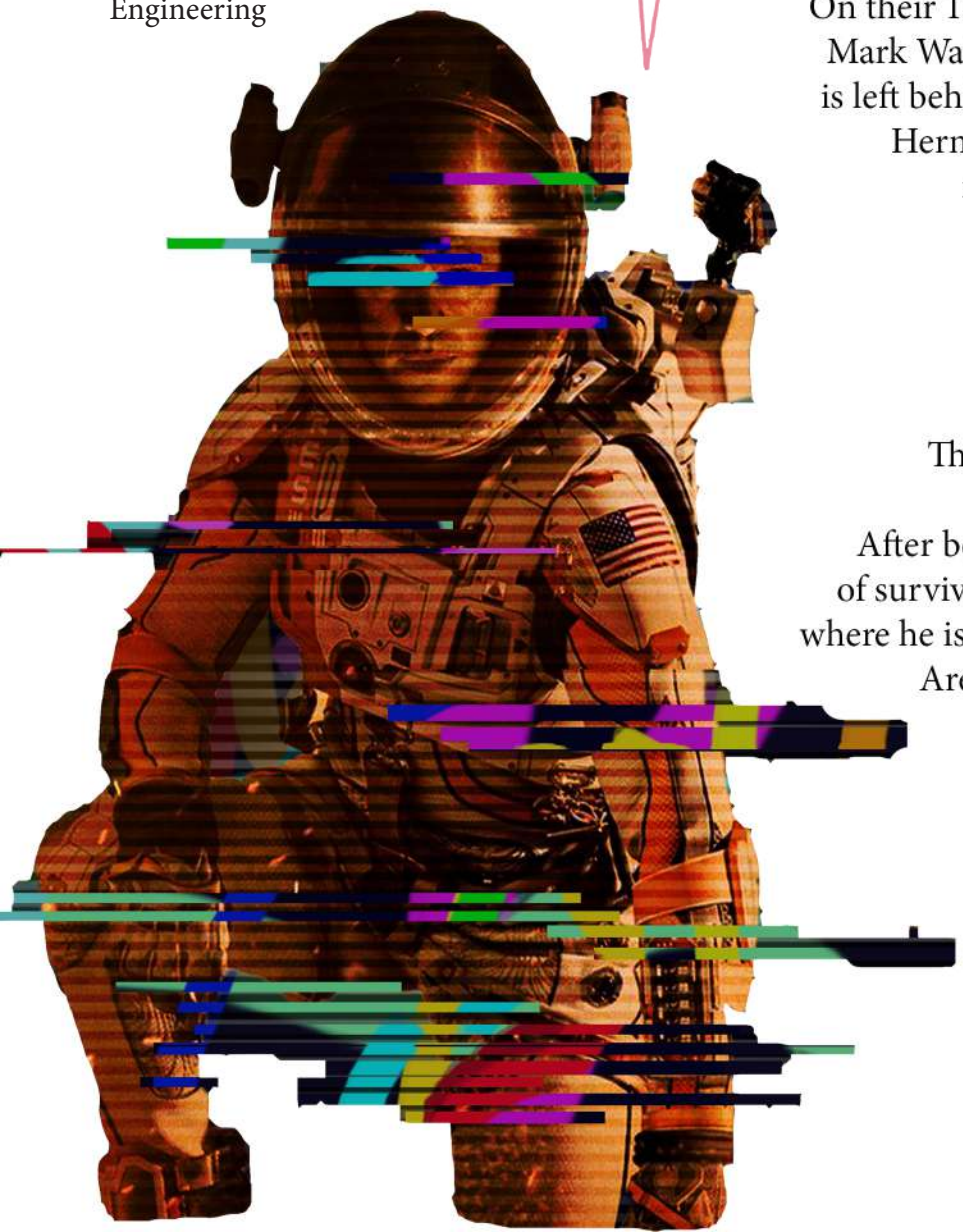
Individual sports like swimming and running where maximum efficiency is of utmost importance use video analysis to make small modifications in the player's motion. Coupled with an apparatus that measures the speed of the athlete, we can identify mistakes and learn novel techniques that improve performance. Injuries can also be prevented when the technique used is perfect. Overall the amount of data that can be extracted has increased, armed with this new knowledge coaches and players are performing personalized training and exceeding limits that were once thought to be impossible.

DHYANESH B.
B.Tech 3rd Year, Material Science and Engineering

DECODING 'THE MARTIAN' THROUGH A SCIENTIFIC LENS

The Martian came just a year after Interstellar. So it is logical that after doing an article on Interstellar last year we follow it with The Martian. The movie is based on the book by the same name written by Andy Weir. It is considered the most scientifically accurate movie of all time, much better than Interstellar, which took a quantum leap of belief in the movie's third act. There are some discrepancies here and there, but mostly it gets the science spot-on. Neil deGrasse Tyson said about the film, " The Martian, where you experience love, hate, envy, anxiety, pride and heroism... all through the lenses of science."

BHAVYA GUPTA
B.Tech 2nd Year, Chemical Engineering



The story begins in 2035. The crew of Ares III is exploring Acidalia Planitia on their 31 sol mission. On their 18th day, they encounter a sand storm. Mark Watney is struck by the flying debris and is left behind on Mars as the other crew goes to Hermes, their orbiting vessel. It is the only major scientific blunder in the movie. The atmosphere of Mars is just 1% as thick as that of Earth. Therefore, it cannot have that amount of force to knock down human beings.

There is no chance that it could happen.

After being stranded on Mars, Watney's plan of survival is to go 3200 kilometres away from where he is at the Ares IV landing site. However, Ares IV is not landing for four years and for that he requires food. Watney is a botanist, and he grows potatoes using Mars soil and human faeces.

This part is very accurate. The martian soil lacks some nutrient required for the growth of plants, but those are provided by humans poop. The water was supplied by disassociating hydrazine from rocket fuel into Nitrogen and Hydrogen. Then Hydrogen is burnt with oxygen to form water. The process is accurate and is used by NASA. However, there is a slight issue, and it is not because of the writing. At the time of the movie, it was not known that the Martian soil contains perchlorates. Perchlorates are toxic to humans. They can be removed just by washing the potato in water and rinsing them. However, that would disturb Watney's water calculation and cause a shortage of water. The water shortage problem would not occur now as it is found out that Martian soil contains 5% water at low altitude. Surviving at Mars has become much more manageable.

Next, he founds a way to communicate with NASA, and everything is according to science. Everything goes on track until Murphy's law strikes. Well, it is space, and there is a reason why it is called the final frontier. Nothing is easy up there. The Hab, where Watney is growing plants, is destroyed, and he is stuck with limited food supply. The probe, which was supposed to take essential food supplies to Mars is preponed due to lack of time, and it explodes after take off.
The next part is the most brilliant. Rich Purnell, played by Donald Grover comes with a fantastic idea of using Gravity as a slingshot (also known as Gravity Assist) and sending Hermes to Mars in time, with all the food and fuel supplies given to them when they are near the Earth. In Gravity assist, the spacecraft travels close to the planet and uses its Orbital Energy to accelerate itself. Voyager I and Voyager II have used this technique.

The next issue was sending Watney back into space to the Hermes. Watney uses MAV (Mars Ascent Vehicle) of Ares IV to go into space. The MAV was there because NASA sends the equipment in separate launches to reduce the weight. The usage of MAV is to send the astronauts back to the orbiter. The next part is confusing. The MAV has to lose weight so that it can intercept the orbiter. It is because the orbiter will again use the Gravity Assist to go back to the Earth. Hence its speed would be higher and to achieve that the MAV has to lose weight. The reason for letting go of the roof is also entirely explained. The atmosphere was Mars as said earlier is very thin. We get high enough that the atmosphere becomes irrelevant before we are going fast enough that the atmosphere is a threat. Despite all of this, The MAV does not reach the required speed, and Watney has to use the escaping air from his glove to propel towards Commander Melinda Lewis, who is using Manned Maneuvering Unit.

The Martian got almost all the science right. Where it did not, we can understand.
A Mark Twain quote completely justifies the movie.
"Get your facts first; then you can DISTORT them as you please."

CLUB ACTIVITIES

Technical clubs are the heart and soul of IIT Gandhinagar. With that in mind, we asked the clubs what they are all about and how they are involved with the student body here at IIT Gandhinagar

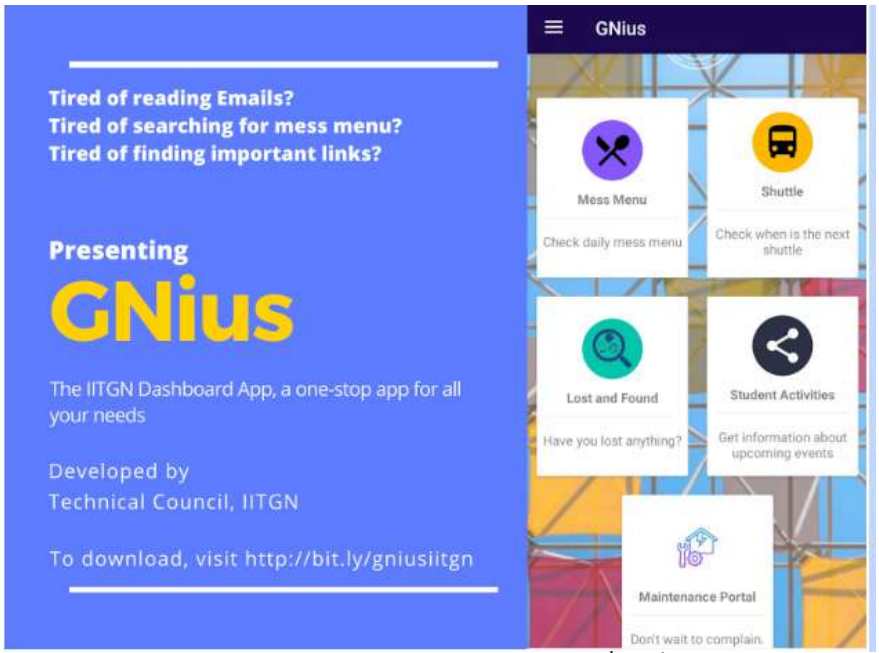
METIS

Club Secy: P Jayakrishna Sahit

Metis always strives to help nurture the growing culture of coding on campus. Given that computer science is now gaining traction on campus with the advent of CS programs, Metis is striving and working towards trying unique things to help develop the love for coding and computer science in general with fellow students. Apart from the regular assignment of projects on a term basis, this year the club implemented things differently and came up with new ideas.

The major pillar of support and driving force of Metis are the 'Metis Mentors', who are enthusiastic third and second years students, excited to teach what they are good at, thus following a more decentralized approach. Some of the notable projects from the club included the GNius app and the launch of IITGnConnect.

GNius app is a dashboard app that solves as a one-stop solution for all the needs of the students. It consists of several different features including mess menu, shuttle timetable, student activities, lost and found packages all at the click of a button. This app was developed by Rohit Patil, Shaurya Agarawal, Ankush Chauhan and Rushil Shah (all B.Tech '17 CSE). The app can be downloaded from Google Playstore.



IIT Gandhinagar now has its very own social platform, IITGnConnect, and it has gone LIVE!. It's like our own mini Intra- college Facebook. We believe the community can use this to promote discussions, spreading important information, marketing events, etc. which would otherwise be a clutter. IITGnConnect is an open platform provided so that students can voice their thoughts and opinions on college activities. Course-related material can be shared and other discussions might also be initiated. It is a

perfect platform for the various clubs and organizations to share and promote their activities. This was developed by Jayakrishna Sahit(B.Tech'16 CSE), Gowtham Chitipolu (B.Tech '16 Dual degree, ME and CSE), Kukunuri Rithwik (B.Tech '16 CSE) and Sai Praneeth Maddi (B.Tech'16 EE)
One can mail the team (team@iitgnconnect.net) to create their own page. To join the iitgnconnect's mailing list, trail along the following link:

https://groups.google.com/a/iitgn.ac.in/forum/#!forum/iitgnconnect.pvtgroup/join

Here's what the club secy, P. Jayakrishna Sahit has to say about the progress of the club so far-
"I think what is different about Metis compared to coding clubs in other IITs is the fact that we are open to everyone without biasing on the knowledge you know and the same time not compromising on the quality of work we are doing. I really believe that everyone should be given a chance to learn and at Metis, my teammates and I are continuously working towards it.

By the end of my tenure and also, in the long run, I would want the students of IIT Gandhinagar who are afraid about not knowing to code, to look up to people in Metis as extremely helpful people who will lend a hand in so, for students to see coding of any form as more than just a method of landing a job in a good company but rather a method to develop and work on some of their very own ideas and for students to recognize working in this club as something equivalent to doing research under a professor."

ODYSSEY

Club Secy: Shah Meet Parag

This year the club has been very active and conducted various workshops and events, some of which were new initiatives.
'Astroctivity': Astroctivity is a new initiative taken up by the club, aimed at encouraging students across different disciplines and programmes to relive their passion to learn about space. Till now, 4 sessions have been conducted under this initiative during which a number of activities were planned including Documentary screening, fun games, movie screening, and presentation by club members.

Club Trip: The idea of club trip was implemented last year. Club trip was started with an objective to explore the universe and to learn more through observations by our own telescope. In the previous year, the trip was planned to the Polo forest and the students observed ample of objects and bodies in the space. It was a pleasant experience and the sky was far more clear to watch and observe.

Astronomy Quiz: Every year, the club organizes a quiz on astronomy open to IITGN community. On an average 25 students participate each year. The quiz is conducted in 4 rounds and a bonus 'open-to-all' around is planned for non-participants. The winners are rewarded and consolation prizes are distributed in the open-to-all round.

Talks: Odyssey plans and arranges at least 1 talk each year. Last year, a session was conducted by Mr Samir Dhurde from IUCAA, Pune. In the coming semester, the club is planning to have talks by our own capable faculties and is also looking forward to inviting speakers from other universities and centres.

Sky-Gazing session: Odyssey tries to keep sky-gazing sessions at regular intervals. Generally, moon, Jupiter and Venus are primary astronomical bodies that we observe through our telescope

Other activities: Apart from all above mentioned major activities, Odyssey has a track of conducting small activities also. One of them is 'Astrocorridor' where posters, placards, etc were displayed and the team decorated the whole PC to make it look like an astronomy corridor. The team also regularly post informative ideas and posts on the FB page to share the knowledge with all the astronomy lovers.

E-Yantra:

The team comprising of Praveen Venkatesh, Chris Francis , Hari Dave and Amey Kulkarni cleared the first round of e-Yantra, the annual robotics competition organized by IIT Bombay in association with MHRD. The team worked on the task of performing a survey and rescue mission where a drone simulates the act of providing support and rescuing people in the event of a disaster. The drone autonomously travels various pre-planned paths to achieve the optimal way of providing help to the maximum number of people in the least time.

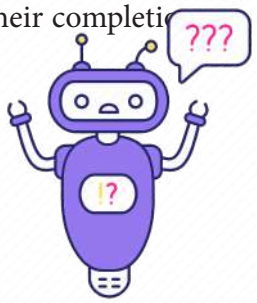
MEAN MECHANICS

Club Secys: Anirudha Pradeepkumar Soni and Ajay Kumar Ucheniya

Mean Mechanics, the robotics club of IIT Gandhinagar aims to introduce the students with robotics and its applications and provide them with hands-on experience. This year, the club was instrumental in the event Build-a-Thon that was hosted in collaboration with Tinkerers' Lab. This event aimed to engage the students in solving a particular given problem with their skills and creativity in a limited time. Another Competition called Mini Quest was held exclusively for the first year students by the club which also revolved around the idea of DIY and hands on practice. There are various short term and long term projects undergoing in the club and soon the community will be informed about their completi
Some of the workshops that are planned in this semester are:

- Microcontroller and microprocessor (like Arduino and RaspberryPi) workshop.
- Aeromodelling workshop.
- CAD and simulation workshop.
- Wireless communication workshop.

While you sneeze, all body functions stop, even your heart.



DIGIS

Club Secy: Vrutik Chandresh Shah

DigiS, the game development club, has been fairly active this semester. It received enthusiastic participation from the club members and from the student community as well through the various competitions organized. The club came up with interesting and innovative projects this year. It is also exploring some projects on VR and AR.
Some of the activities in the semester were

- Club Orientation for Freshers
- Unity3D workshop for club members - it was an introductory workshop on basics of using Unity3D. The participants finished making an android game from scratch.
- Blender Workshop for the Student community - Blender is a very important software when it comes to 3D modelling, Simulations, Video Editing etc. The workshop introduced the software and we walked everyone through the making of a 3D racecar model. The workshop saw good participation and we received positive feedback from the attendees.
- Organised 2 rounds of the PlayPro2 Contest - This was an open competition for the community where they had to play the games
- Uploaded 3 games to the Playstore. One of the games got over 500 downloads.

Some of the activities planned for the upcoming semester are:-

- AR workshop/VR workshop for the student community
- Gaming Night for the club members
- To use AR to digitize the Tinkerer's Lab
- Participating in Game Dev contests

COLLEGE ACTIVITIES

AMALTHEA

The decennial edition of the Annual Technical Summit of IIT Gandhinagar was along the lines of the theme, 'Transcending Boundaries' and was organized by the students on the 19th and 20th October 2019. From making the thinnest nanomaterial to reaching Mars, from building towering skyscrapers to imaging black-holes, we are making the impossible, possible. The theme represents the ideology of limitless reformations and innovations surrounding us.

The 2-day summit witnessed interesting and insightful talks in the Conclave featuring some very eminent personalities like Mr Neel Gala, CTO/Co-Founder of InCore Semiconductors and technical leader of SHAKTI indigenous processor systems; Mr Abhinay Bhasin, Associate Director (South Asia), Data Sciences, Dentsu Aegis Network, India; Mr Sudarshan Sen, the Former Executive Director of RBI; Dr S Christopher, who was the former chairman of the DRDO and Program Director of "Netra", India's indigenous Airborne Early Warning and Control System (AWACS) etc.

The 5th edition of the Symposium at Amalthea was held on the theme: Drug Discovery and Distribution: Taking a leap. This Symposium aimed to connect people from various pharmaceutical companies with each other as well as a few academicians and industry experts for mutually beneficial collaborations and research. The Symposium received overwhelming participation from the industry as well as academia.

The Tech Expo, formerly known as Exhibition had some very interesting products and technological solutions at its display. Some of the notable products were: Virtual reality-based products, interactive robot PaPeRo, Indro 3.0, the tallest autonomous humanoid robot in India etc.

This edition witnessed overwhelming participation in the various events that were conducted. Offline events included DRA, Drift, Roboquest, Electronica, Techarts, Chem-e-Car, Brainwiz, Inquizzed, Amalthea Open 2019 and Icon. Online events included D'code, CryptixCTF and Logix.

Odyssey Astronomy Quiz

Akshay Tanjudle secured the first position, Karthik SK and Abhinav Singh secured the second position and Shubham Rastogi and Siddhart Gangwar secured third prize in the Astronomy Quiz conducted by Odyssey on 17 Nov 2019.

IGNITE 5.0

The 5th edition of IGNITE was on the lines of the theme 'Technologies for Future'. This two-day event was organized on 16th and 17th March 2019; The idea behind the theme was to try ad get a glimpse of how and with technology when integrated into our lives will have the power to reshape the future. The event witnessed Technical Talks, Workshops, Exhibition and various technical and non-technical events. Robowars, Mono Rail (A bot suspended on two rails at 30ft and tasked to hit the target), All Terrain Vehicle, Igne Quiz, Phoenix Hunt (An app-based treasure hunt competition), iTinker (a 24hr build-a-thon held in association with Tinkerers' Lab), CodeIt (Coding competition), Lab Tours, Project Expo (which witnessed an enthusiastic participation from the student community displaying their projects), and workshops like CAD Modelling and on IBM Watson, were the main highlight of the two-day event.

WINTER PROJECTS 2019

Winter projects in an initiative by Metis, the Coding Club, for students to be able to work on projects which interest them with the help of mentorship from the club members. Through this, the club wishes to extend its hand to people outside the club as well.

Shruti Katpara, a sophomore in Computer Science and Engineering, is developing an android application, through which she wishes to strengthen her skills in development which will help her in making a product by herself which she can sell to the market. She has also been able to get comfortable with Machine Learning thanks to the guidance provided by the Metis team.

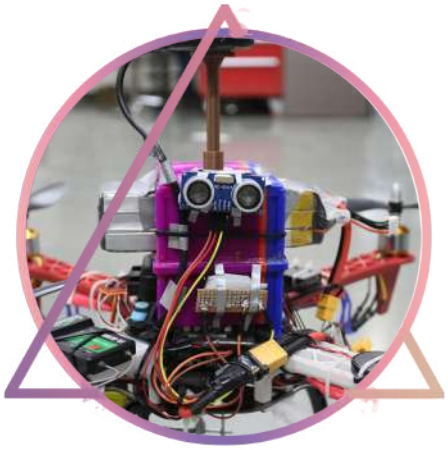
Another project or rather study program is being worked on by Abhigyan Martin Ninama, a freshman in Computer Science and Engineering, who wish to understand more about image deionising, a deep learning problem, and is also exploring the field of machine learning under the guidance of the club mentors.

Tech Meet

The team comprising of Ajay Kumar Ucheniya, Pravesh Srivastava, Purna Kukadiya, Ailneni Rakshitha, Devesh Kumar, Deepanshu Singh, Henil Shah, Pandrangi Aditya and Satish Kumar Singh stood 7th in the DRDO SASE UAV Fleet Challenge Event.

Dishank Goel, Karnam Avinash, Pundru Chandrahas and Rama Krishna Reddy secured the 11th position in the Payatu Infosec event .

SSTP-2019



The Students' Summer Technical Projects, abbreviated as SSTP is an initiative by the Student Technical Council to encourage first-year undergraduate students to work on some challenging projects and gain hands-on experience. The SSTP-2019 was organized from 13th May 2019 to 2nd July 2019 for the freshers of 2018 batch. In its second edition, three determinate teams were involved in great engrossing projects. The teams were guided by a faculty mentor for their projects.

Team TelescoGalvans designed an "Automated Telescope System" which can automatically orient a telescope towards a celestial body. The team comprised of Aditya Tripathi, Hari Dave, Devvrat Joshi and Ayush Kumar with Prof. Shanmuganathan Raman as the faculty mentor.

Another team comprising of Dhyey Jani, Utkarsh Nanda and Dhruvin Shah built a "Splash-proof Quadcopter" under the guidance of Prof. Harish P.M. The third team of Permender, Yashi Gaur and Preeti Chiluveru used the concept of image processing and developed a "Ball-Tracking Bot" with Prof. Nitin Khanna acting as their mentor.

TECH RADIO

With several exciting and enthralling technical happenings occurring at the institute premises at IIT Gandhinagar, 'Tech Radio' is a series to explore these technical instances and bring it onto the platform of IITGN community. Tech Radio initiated with its first series on January 15, 2019, during the tenure of Rushali Saxena (2018-19) as the Tech-Secy. This is an initiative by the Student Technical Council of IIT Gandhinagar. The series has featured several projects by the students and products and innovations from competitions and immersion programmes such as the Inter IIT Technical Meet, Invent@IITGN and SSTP. The venue for Tech Radio is one of the common hang-out destinations for many of us - '2 Degree Cafe'.

TINKERERS' LAB

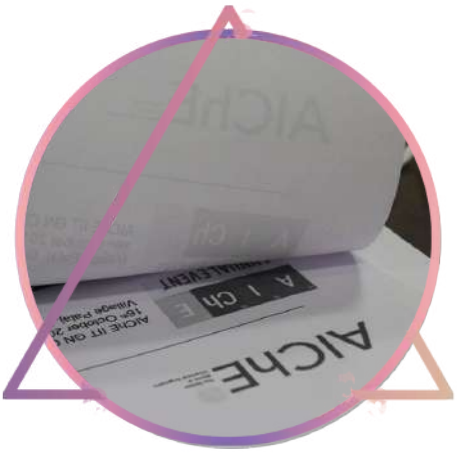
Tinkerers' Lab provides an opportunity to learn while you do. This year the lab has been pretty active in conducting various workshops and events and was the main workstation SSTP 2019, Invent@IIITGN 2019, Inter IIT Tech Meet 2019 and Inter IIT Cult Meet 2019. The semester was kicked off by conducting the 2nd edition of the 'How Stuff Works' series where students applied the concepts of reverse engineering, opened up an IC Engine and learnt about its working and its components. The workshop was organized by TL team members Ayush Kumar and Ashish Chavan. During Amalthea'19, the lab hosted an event called Build-a-Thon, a 36-hour event where the participants had to build a robot based on the given problem statement. The Tinkerers' Lab assisted them by providing the required materials.

The lab also successfully conducted the second edition of iTinker, an event in IGNITE 5.0. The event lasted for 24 hrs where participants had to come up with a technology-based solution for the given theme,'Internet of Things', with a demonstration of prototype/solution at the end of the event. It saw an overwhelming participation of 25+students in various teams.

The lab also helped the Cultural Team of IITGN. The team participating in the fashion show designed their props and costumes using the facility of laser cutting on MDF sheets and acrylic sheets. They even made use of several tools available in TL such as filer, hand glue, etc. The team gave a splendid performance and went on to win the bronze medal in the cultural meet held at IIT Bombay.

The lab is also working on very interesting projects like Automatic Inventory Lock Management, Automatic Floor Cleaning Robot etc that are being undertaken by the team itself and soon will be ready to be implemented.

AICHE:



The AIChE IITGN student chapter started the academic year with the orientation of the freshmen students. The session was aimed to clear all doubts and perception regarding chemical engineering. Students were enrolled for AIChE membership and were told about all the benefits of the platform. This year, the first edition of Chem-e-Car competition was introduced in collaboration with Amalthea '19. Participants from various colleges around the country were invited to design their own chem-e-car and compete with each other. The competition had multiple rounds including a safety check and viva. Chem-e-Car is a car that is solely powered by a chemical energy source. It is optimally designed to safely run a car by various chemical reaction-based energy sources (used to propel the car), that can possibly replace the fossils in the near future as the main source of energy. The teams executed different ideas to run their chem-e-car and were judged upon various parameters like safety check, stopping mechanism, distance travelled, deviation etc. Teams were from different colleges like Nirma, SVNIT, GSFC etc.

INVENT@IITGN-2019

Originated in the U.S. Invention Factory and organised only at IITGN in India, the second edition of Invent@IITGN was held across 6 weeks at the institute. The 28 students who got the opportunity to be a part of this immense program were selected from the various IITs across the country. They received direct guidance from founders of the original program in the U.S., Cooper Union Professors Alan Wolf and Eric Lima, and IIT Gandhinagar Professors- Prof. Vineet Vashista, Prof. Nithin George and Prof. Madhu Vadali. The students were divided into groups of two. The 14 teams even filed a provisional patent at the end of the program.
Some of the projects by the students were - 'Smart Sun Visor' by Jay Shah and Souritra Garai; 'Food Buddy' by Praveen Venkatesh and Chris Francis; 'Heal It' by Neha Priolkar and Mann Goel; 'Med Mind' by Arpita Kabra and Lipika Gupta; and 'Easy Carry' by Jainam Shah and Anuj Sindga.

TORQUE Weekly quiz winners:
TORQUE conducted its weekly quiz series on Saturdays. The quizzes were based on current trending tech topics. The winners were selected based on the highest aggregate. They are
Amit Yadav, Sumit Kumar, Sammed Kagi

INTER IIT TECHNICAL MEET - 2019

The IITGN student community participated with great enthusiasm in the 8th Inter IIT Technical Meet. It was organized by IIT Roorkee from 20-22 December 2019. A team of 60 students participated across various events ranging from 'high-prep' events such as DRDO SASE's UAV Fleet Challenge, Ashoka's Tech for Change Challenge, DIC's Terrace Farming Robot for Hilly Areas to 'mid-prep' events like Student Academic Conference to 'low-prep' events such as NeenOpal's Case Study Competition, Payatu's Infosec, Coding Hackathon and Engineer's Conclave. The IITGN contingent secured bronze medals across 3 events:

1. DIC's Terrace Farming Robot for Hilly Areas:

- The teams were required to develop a lightweight robot that can do the work of ploughing, seeding, watering, or harvesting considering the above-mentioned challenges for terrace farming. The teams were also required to produce a reliable navigation plan of the robot for autonomous navigation in the field.
- The team members were: Satyam Kumar, Jaydeep Kakadiya, Souritra Garai, Pushan Patel, Jay Shah, Rahul Gupta, Neel Patel, Ankush Mishra, Abhinav Singh and Soham.

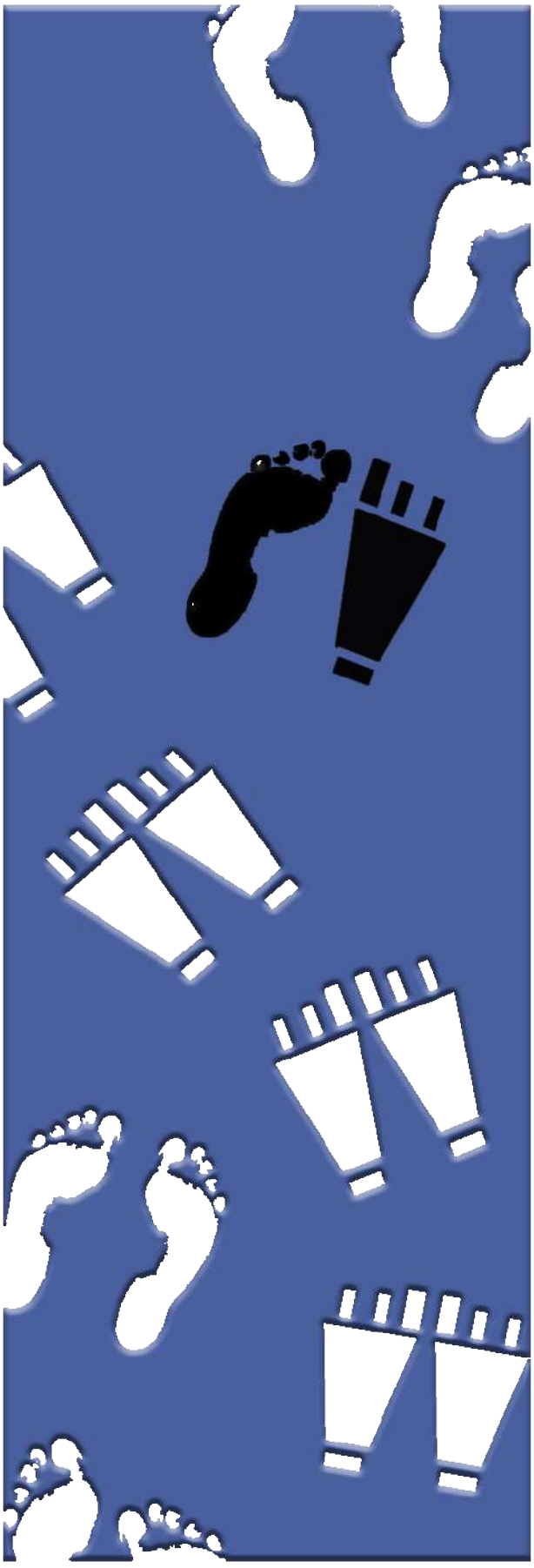
2. Ashoka's Tech for Change Challenge:

- With the vision, "Technology is not an end in itself, it's a means to an end", the participants were asked to develop a product using technology to solve an existing societal problem and form a suitable business model around the same.
- The team participants were: Shivanshu Sharma, Suryansh Kumar, Rishi Patidar, Harsh Patel, Palak Purohit, Shivam Sahni, Rahul Patel, Harshit Kumar, Viraj K.Shah and Dhruvin Patel.

3. NeenOpal's Case Study Competition:

- The problem statement consisted of a hypothetical multi-domain company that wants to enter the Ghee industry. The participants had to provide a "Go-To-Market" Strategy for the company.
- The team participants were: Rohan Shirodkar, Maitreya Thakur, Vaishnavi Kokadwar.

The IIT Gandhinagar contingent secured an overall 14th position amongst 20 IITs in the recently concluded Inter IIT Tech Meet.



A POSSIBLE CURE FOR ALZHEIMER'S: THE MINDEYE

Did you know that one out of every ten people aged above 65 is diagnosed with Alzheimer? Sounds scary but it is a fact. Alzheimer is one of the most dangerous diseases that exist today, and the thing about it that makes it so is that it is seldom detected until it reaches the critical phase.

Alzheimer is an irreversible and progressive deterioration of the brain, which leads to the inability to perform essential life functions properly like reading, writing, movement and memory loss. It is tough to spot the symptoms of Alzheimer when they show up for the first time (the dementia phase) because they are so inconspicuous; like vision going down or small glitches in memory which also happen as a normal phase of ageing up. Nevertheless, the disease slowly progresses, and by the time it is detected, it is too late. Often.
Finding out a way to detect it in the early stages has been a matter of constant research and debate in the past decade, and doctors and scientists from all over the world have been trying very hard.

It is indeed a matter of great pride for us as Indians and as IIT Gandhinagar students that Prof. Uttama Lahiri of IIT Gandhinagar, in collaboration with Anirban Dutta at the University at Buffalo, New York and Abhijit Das at AMRI, Kolkata has developed a technique for detecting dementia at very early stages as a precursor to Alzheimer.

There exists a stage between the expected decline of vision due to normal ageing and the decline due to dementia. It is called Mild Cognitive Impairment (MCI). Prof. Lahiri's project, nicknamed "MindEye" aims to detect de-

Prof. Lahiri's project, nicknamed "MindEye" aims to detect dementia in this stage.

The patient is made to go through six easy tests, which mostly include detecting deliberately articulated patterns and memory tests, which test the vision and memory of the patient. In one of the tests, the person is made to see a pattern of black dots against a white background on various quadrants of the screen, which is equipped with a high-resolution infrared camera. Another one includes the person recalling the movements of his eyes and reproducing the pattern he saw on the screen. This tests the memory of the subject.

There have been some other noteworthy attempts all over the world to detect Alzheimer in the early stages, but what makes this one so outstanding is its convenience- both economically and process-wise. It is very cost-effective, and it does not require the person to be literate or trained in any way. The other existing methods to detect dementia in the early stages include a pen and paper process as no electronic device for this has been devised yet. Both these factors make "MindEye" so important in India and other third world countries, where a majority of the population is still in rural areas or below the poverty line.

Till now, this process has been tried on almost 1700 people, the trial being conducted in West Bengal. Although it has been mostly successful, there is one concern which was pointed out by Thomas Hutton, former director of the Texas Tech Alzheimer centre. MindEye depends on visual stimulation to a large extent, but vision can also be affected by a variety of drugs and medication which old age people are often prone to it. Mr Anirban has consented to this being a possible flaw in the process, and they might work on it. It has not been confirmed though.

Whether MindEye succeeds or not, it marks a revolutionary step in the progress of the study of Alzheimer. This is just one small example to show how dedicated our professors here at IIT Gandhinagar are, and what we are providing back to society. Imagine what we could achieve if we put the brightest minds in the country, us IITians, along with the experience and capabilities of our professors. The day would not be far when we might even come up with a cure for Alzheimer! The future would not be far where we would wake up every day and find the world a better place.

AYUSH ANAND
B.Tech 1st Year, Computer Science and Engineering

PlayPro2 is the second edition of the intra-college gaming contest conducted by the DigiS club. The idea is to have the student community compete against each other by playing games developed by the members of the club itself.

Colour Chase (first version)
Aditya Pusalkar
Shril Mody
Yash More

OsciRunner (second version)
Eshan Gujarathi
Abhiram Geddam
Neel Patel

WaySwitch (second version)
Rahul Gupta
Vaibhav Sharma
Videsha Bansal

BLOGGERS SPOT

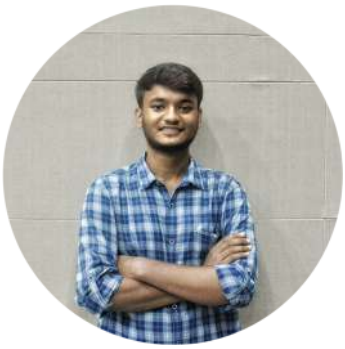
It is very rare to find tech minds who are interested in penning down some of the million other thoughts and ideas that keep flooding their oh-so-intelligent and clever minds. TORQUE is proud to feature some of these rare species in the Blogger's Spot. Blogger's Spot is an initiative to highlight articles and blogs written by students that are not a part of the team but are enthusiastic about creative writing and blogging.

This time we are featuring the blogs of the winners of the Online Blog Writing Competition that was organized in Amalthea '19 in collaboration with the TORQUE magazine. The topics given were as follows:
1. Space Exploration
2. The Advent of Digital Transaction.
3. The Rise of the Pharmaceutical Industry.
4. Digital Analytics and Data Privacy

The winners of the competition were: Pratyush Bhatt (Sophomore, Chemical Engineering), Anas Ali (Sophomore, Civil Engineering)and Ayush Anand (Freshman, Computer Science And Engineering).

Ayush Anand (Freshman, Computer Science And Engineering)

Pratyush Bhatt (Sophomore, Chemical Engineering)



Anas Ali (Sophomore, Civil Engineering)

Best Poster Awards

Utkarsh Gangwal and Deepak Kamboj (SRIP Intern 2019 under Prof. Mayank Singh and Prof. Udit Bhatia) won the best poster award at the Society of Risk Analysis, Washington DC for their work, " A Network of Network Approach for Cyber-based Contingency Analysis of Interdependent Infrastructure Networks under Uncertainty".

SPACE EXPLORATION

The CEO of SpaceX Elon Musk once quoted, "I would like to die on Mars. Just not on impact. "

Musk made his intentions clear that he wants to achieve what others think is beyond science. Keeping this in mind, Musk started his own company SpaceX in the year 2002. His aim is very much in line with this year's Amalthea's theme "Transcending Boundaries." SpaceX aims to reduce the cost of space exploration and to facilitate the colonization of Mars. Space exploration is nothing new to the 21st century. Scientist and researchers from the past are trying hard to learn about the great mystery that they call-Space. It all might have started from a general curiosity that what is out there above the skies far from the land we live on. This curiosity led humans to think outside the box and work hard to discover what lies beyond our skies.

Russia (then USSR) led this great revolution of space exploration as on October 4, 1957, it launched its first artificial satellite Sputnik 1, into space. In the following year, on January 31, 1958, America launched its artificial satellite Explorer 1 into space. Explorer 1 proved to be a very successful mission, and it also helped scientists in carrying their research forward. A few years later, on April 12, 1961, Yuri Gagarin became the first human to go out in space and orbit the earth. Since then, there is no turning back. There have been many missions of space exploration of various natures. Four broad types of space exploration are flyby, rovers, orbiters, and human space explorations. As the technology evolves and human's curiosity grows, we continue to explore the outer space as much as we can.

Let us also discuss some of the modern-day researches that are being carried out. The significant areas of interest to researchers are Moon, Mars, and Space Mining, Mars being the focal point of this research. Colonization of Mars is one of the prime targets of NASA. From the various Mars missions, it is evident that Mars has a thin atmospheric layer and has frozen groundwater. So, Mars has the potential to sustain human life. Colonization of the Moon was also proposed earlier, but due to lack of atmosphere and water on the moon, it seems impossible to colonize it.

Another groundbreaking research going on related to outer space is Asteroid Mining. It is the extraction of essential raw materials from asteroids and near-earth objects. As per space law, this is a legal practice. Precious metals like gold, platinum, and silver can also be obtained while metals like iron are also available in abundance. The major obstacle in this program is the cost of space flight and untrustworthy identification of asteroids.

The deep dark space lies out there to be explored. Humans curiosity drives us to learn more about it. There is a great amount of research going on in the field of Space exploration, and it is opening new doors for human life.

ANAS ALI
B.Tech 2nd Year, Civil Engineering

THE ADVENT OF DIGITAL TRANSACTION

Digital Transaction-the epicentre of this revolutionary phrase, can be traced back to the 'material' days of the 1990s. Until a strong impetus was laid by the Stanford Federal, the first institution to offer online banking services to its very own customers in 1994, the transactions were still mostly conducted using cash. Early aces in the world of digital deals were Millicent and Ecash, which offered micropayment systems based electronic alternatives to cash, such as e-money, tokens, or digital cash. Business magnate Jeff Bezos was one of the core altruists in building up the online payments in 1994, followed by the entry of the online payments giant PayPal Holdings Inc. in 1999.

By 2010, 'cashless societies' had fairly evolved per se. As per a census conducted in 2015–2016, global non-cash transaction volumes grew at 10.1% to reach 482.6 billion. Sweden moved ahead of the US for the first time to become a global leader in per inhabitant non-cash transactions, recording 461.5 transactions compared to 459.6 recorded in the US. According to a survey conducted in the UK in 2016, 1 out of 7 individuals did not carry any cash along with them. In Sweden, cash is currently used for just two per cent of the value of all transactions and is prognosticated to account for just half a per cent by the end of 2020.

There will inevitably come a point at which the cost of maintaining the infrastructure to support cash transactions will no longer be affordable, which would lead to a tremendous boost in the transition made towards digital payment methods. As per financial experts, rising bank charges and disappearing branches will certainly force businesses to ditch cash-based transactions before customers are ready. A recent report published by 'Access to Cash' advises that going cashless too soon could mean that millions of people will be financially excluded at the risk of exploitation. This evokes the need for governments, banks, and FinTech companies to work as a whole to ensure that the most underbanked, the vulnerable, and the elderly are safe and that the transition towards a cashless society happens as smoothly as possible.

The odds of the rise of digital transaction-based societies are in spades, but so are the hazards of having one. Cyber malefactions are increasing at an alarming rate, no matter how much credibility the transaction platform assures. Safety concerns regarding data privacy and data security are substantially crucial for an individual to 'securely' survive. However, with the advent of cryptocurrencies, some relief can undoubtedly be expected. Nevertheless, the tables can turn all of a sudden, as technology comes with its own downsides.

PRATYUSH BHATT
B.Tech 2nd Year, Chemical Engineering

THE SCINTILLATING SPACE

Space. The word is enough to delve into the never-ending mysteries of it. Our mind is the most powerful "thing" in the entire universe (or the multiverse), and yet it cannot do much but speculate what lies beyond the Milky Way. Do aliens exist? Is there water and oxygen on some other planet than Earth, maybe even more habitable than Earth, but lying in a parallel universe. Parallel universes? There has to be a horizon where they merge or overlap? What about a wormhole? A space-time anomaly was providing us with a pathway to some other point in space. Would we be able to survive the journey? We forgot to incorporate the fact that time being a different dimension altogether, maybe even if we enter the wormhole and survive the journey, but at the wrong time, we might reach somewhere else entirely! What if the black holes were supposed to be the fulcrum of the convergence of all dimensions? There is so, so much to explore.

Space exploration is not just about space; it is about time as well- courtesy of the famous theory of relativity. So, if we look at it from a broader perspective, time travel is linked to space too! Where does space exploration lie in today's world? Perhaps not where it should have been considering our progress in other fields. Of course, it is challenging, at least today, to bring a complete space exploration mission into effect considering the burden it lays on the resources and the threat it poses to the astronomers' life but it still has been suppressed among the other "immediate concerns and interests of the world".What we do not realise today is that space exploration is not just a field of scientific aptitude and the wonders of science that needs to be preserved. We are not very far away from a dystopian future where the Earth is no longer inhabitable due to some epidemic, exhaustion of primary resources as a result of global warming, pollution and all the other favours we have done for our mother Earth in the past hundred years or so. We need to get serious about looking for a new habitable planet for the future generations which are not very far from their advent. We need to understand what space holds at its core, and thus the importance of space exploration is justified.

The world is somehow coming to its senses and has stopped wasting money on wars and disputes as it used to do earlier. It pays attention to space exploration, and after many years of hard work and smart work, we cracked the nut! We finally understand the nature of time, and the convergence of space-time, proposed on a very light basis by Einstein. We are not just dependent on Earth for resources but have other places to go. We understand time at its core now, and thus can access any point in the space-time continuum quite effortlessly. The multiverse is interactive. Species from other galaxies often visit Earth. They say it is cool. So do I, and heck I don't even live on it for most of the time!

AYUSH ANAND
B.Tech 1st year, Computer Science and Engineering

TEAM PHOTO

Row One(Standing, L to R) : Adesh Kushwaha, Pankaj Vatwani, Deepika Soni, Hrushti Naik, Anjana CP, Ekta Khemchandani, Sahit PJ, Dhyanesh B

Row Two(Sitting, L to R) : Ayush Anand, S. Ganesh, Arpit Patel, Arpita Kabra, M.Amitha Rani, Shruti Katpara, Shashi Sarraf, Bhavya Gupta, Ayush Kumar

Answers To Crossword:

ACROSS
2. E.T. 3. Gravity 6. Inception 7. Blade Runner 8. The Matrix 10. Terminator 11. Back To The Future 12. Avatar 13. Alien 14. Jurassic Park

Down
1. Star Wars 4. Interstellar 5. The Martian 9. WALL-E

Answers To Crossword:

ACROSS
3. HP 4. Huawei 6. Alphabet 8. Samsung 10. JD.COM 12. IBM 13. LG 14. Microsoft 15. Sony

Down
1. Apple 2. Intel 4. Hitachi 5. Amazon 7. Panasonic 9. Foxconn 11. Dell


INDIAN I
OLOGY