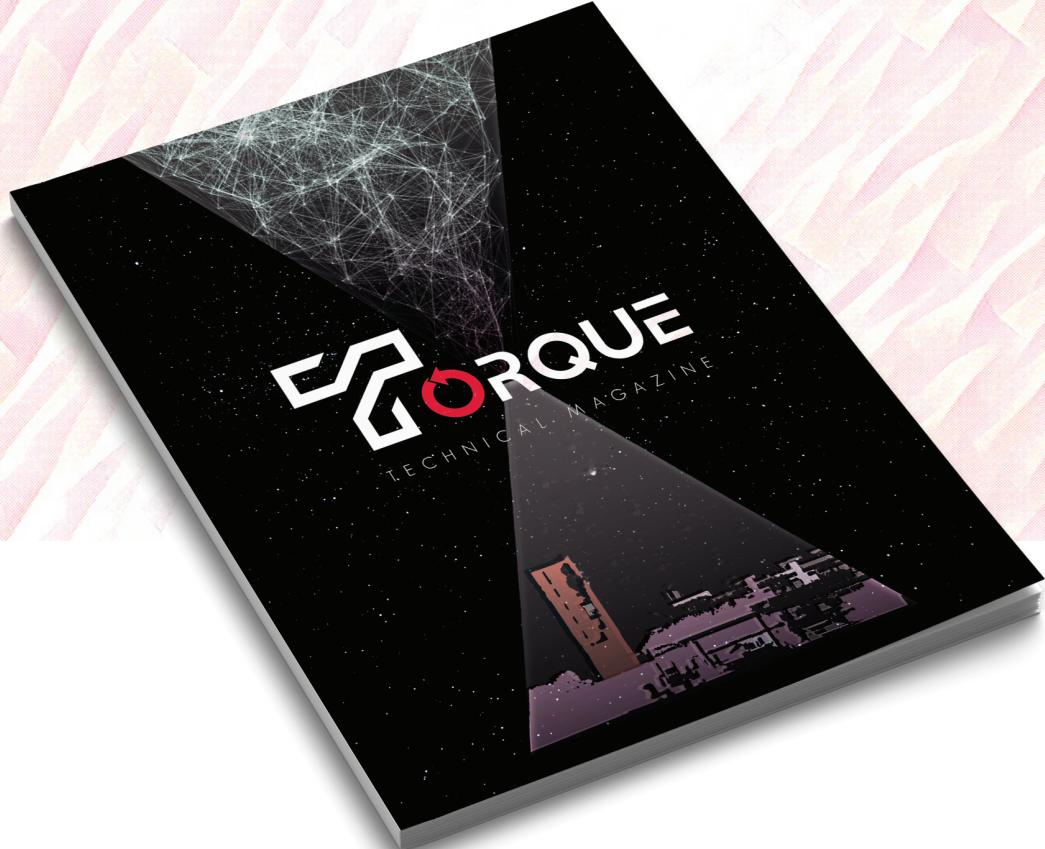




# TORQUE

TECHNICAL MAGAZINE

Vol 1  
2018-2019



An American author, salesman, and motivational speaker, Zig Ziglar rightly stated, “Motivation is the fuel, necessary to keep the human engine running.”

TORQUE is an initiative to bring forth the immense talent IITGN community possesses and highlight the world of tech around us including IITGN and outside. For the first time ever, we are presenting the very own technical magazine of our institute to all of you!

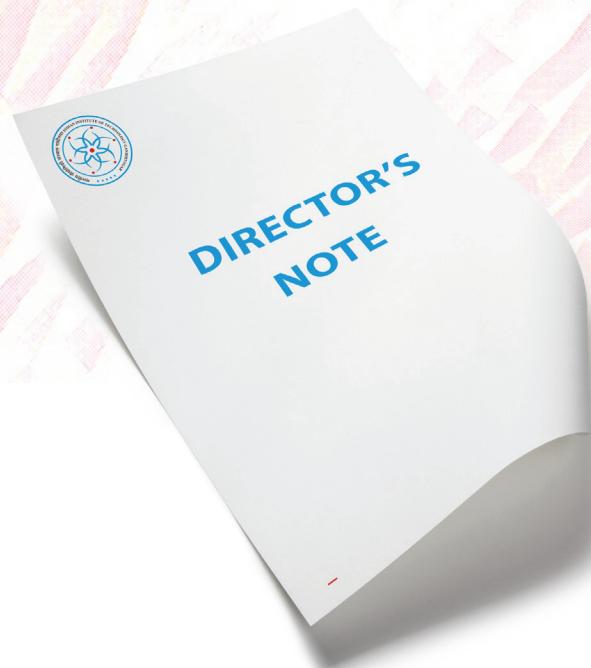
This magazine also takes an initiative to bring into limelight the rarest of the rare species found in any technical institute- technocrats who are into creative writing and documentation! Every article in this magazine is the contribution of a technical mind of this very esteemed institute. A lot of interesting articles featuring recent novel inventions in various technical fields, useful gadgets, mind-boggling facts have been included.

One of the assets that this very first edition of TORQUE possesses is the multidisciplinary nature of the team behind it which gives a rock-solid foundation necessary to sustain this magazine! There are freshmen, sophomores, junior and senior Undergraduates, M.Tech students, MSc Physics, Cognitive Science students etc. The diversity in the team makes it strong and provides a different and interesting perspective to tech @ IITGN.

We look forward to constructive feedback from the community. We hope you enjoy and appreciate our sincere efforts made to make this magazine cover a transient from a vision to reality.

Happy Reading!

-Team TORQUE



Congratulations to the IITGN student Technical Council and the publication team on the launch of the student technical magazine TORQUE. I am exceedingly proud of this independent and student driven project, which epitomizes core institutional values of student autonomy, leadership and the importance and value of learning outside the classroom.

TORQUE will showcase the wide range of technical activities on our campus and the achievements of our students. I believe it will be a valuable contribution to the intellectual life of the Institute as a forum for creativity and expression.

I wish the Torque team and the magazine a long, successful run.

**SUDHIR K. JAIN**

Director

IIT Gandhinagar



## An extra TORQUE beyond the curriculum

To get the best out of an educational experience at an institution of higher education, one must think beyond finishing the requirements of the curriculum and the work assigned by the instructors or advisors. The readily available resources, supportive environment, peers and mentors of all kinds, and the time for learning and trying new things is rarely found later in life. Therefore, the time one spends at an institution such as ours is a golden opportunity to explore wide interests, try various academic projects and non academic experiences beyond the curriculum.

IIT Gandhinagar students are, in general, taking excellent advantage of the various opportunities available for extra learnings and experiences beyond the required curriculum. This is evidenced by the large number of our students opting for minors, project courses, summer internships, extra-curricular (non credit) projects, and not to mention the vigorous participation in various non academic opportunities such as explorer's fellowships, sports, or engagement in various leadership activities.

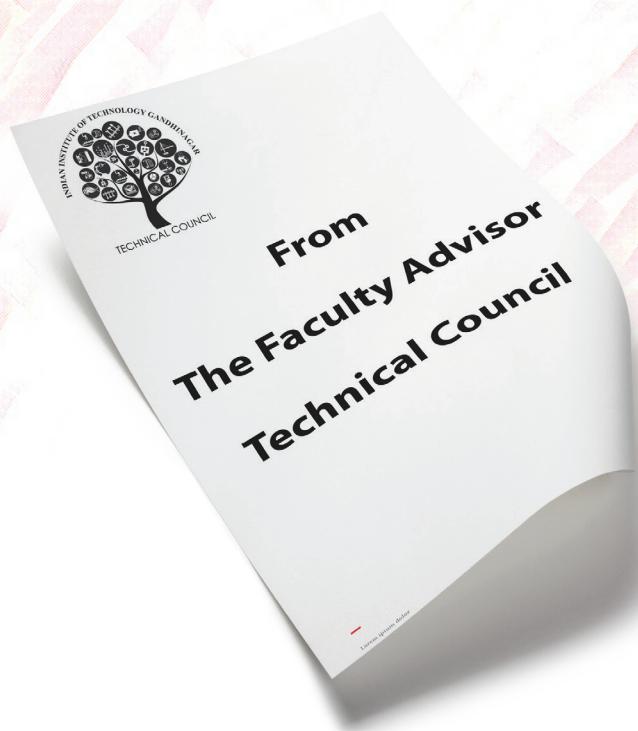
This past year, I felt our students' projects have gotten richer, deeper and more mature, and our students are taking even better advantage of our resources and environment with a large number of student initiatives, both academic and non-academic. The new student-run technical magazine, Torque, has thus come at the perfect time. By highlighting all the wonderful things IITGN students are involved in, it creates a positive feedback loop to further drive this spirited culture. The magazine also serves other purposes. It provides an avenue for students to read and write about technical matters of their interests, and last but not the least, creates one more new non-curricular opportunity to be involved in something substantial.

I am happy to see the extraordinary efforts taken by the technical council and the magazine team to come up with this magazine. The magazine has the potential to turn into a campus essential. I congratulate the technical council and magazine team on this wonderful creation and another fine student initiative. I wish you and the magazine my best, and hope for a long successful run.

Go forth and create an unbalanced TORQUE so that you are always accelerating!

**HARISH P.M.**

Dean of Student Affairs



Making life simpler is what technology has to offer to mankind. The quality of life of a common man largely depends on the functionality, simplicity and affordability of products and services. Today, for almost every need, one finds a solution that's just a click away. Yet how much simpler life can get? The quest is never ending! Who connects the technology to the common man? Scientists, Researchers, Technocrats? Not necessarily always. Young, bright and uninhibited minds, who wish to explore, innovate and are willing to take risks also contribute to the products and services. This is what went through my mind when I visited project demonstrations by the IITGN students at IGNITE 5.0.

If joy of learning is one aspect of campus life, joy of accomplishment is clearly another aspect that constantly motivates our students. On this occasion of releasing the first edition of this magazine, TORQUE, I wish the IITGN students the joy of staying connected with the society through their innovative products and services.

## PROF. S. RAJENDRAN

Faculty Advisor  
Technical Council



Hi!

You are probably reading this note as the Convener of this edition came up with the thought to make our campus get its very own Technical Magazine. “In an already degrading culture, where students do not read much, don’t you think it is a bad idea?”, I recall these words said to me by many people. Students complained at the start of my tenure that they were unhappy with the technical culture here at IITGN. However the same people would be quite dumbstruck and flabbergasted when I would tell them about all the activities that happen in the campus. How many of you know that DigiS, IITGN’s own Digital Sports club, that is actively involved in developing games, assisted in setting up the clubs in other IITs as well?

Possibly it was their ignorance. Possibly, we need to work upon the art of selling our ideas. So here we have a magazine: a fun ride that promises to give the techno-geek avatar within you some food for thought. This first ever Technical Magazine, TORQUE, has been shaped and handcrafted together by one of the most diverse team ever: including MSc, BTechs, MTechs with mix of designers, coders, tinkerers and bloggers.

Hope you all like the first edition! Do let us know what you would like to be featured in the subsequent editions.

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

**RUSHALI SAXENA**

Convener

TORQUE : The Technical Magazine

Technical Secretary

AY 2018-19



Dear Readers of TORQUE,

I feel extremely delighted, privileged and honoured to be presenting you all the first edition of TORQUE, The Technical Magazine of IIT Gandhinagar. After so many brainstorming session, team meets, deliberations, run throughs, edit-checks we are finally ready to show what we have handcrafted for you. I hope you will enjoy reading and also appreciate this small effort made so as to highlight the technical activities and achievements of our students and also act as a platform for the budding writers and bloggers!

As you flip through the following pages, you will encounter a different world. There are interesting articles, blogs, facts, tech-doodles, sections dedicated for the technical activities happening in our college and lots more. As the Editor-In-Chief of this magazine, it was an overwhelming experience for me to coordinate all the activities and team meetings and help make this magazine a reality. It wouldn't be possible without the efforts my team has put in to handcraft this magazine making it informative as well as creative for the readers. Special thanks to the Design Team- you have done a great job!

Since this is the very first edition, there may be many things which you would have expected but have not been featured. Feel free to contact us and tell us what you want in the subsequent editions!

What's the wait for? Turn on to the following pages and imbibe on a new journey. Go ahead and feel the TORQUE!

**DEEPIKA SONI**

Editor-In-Chief

TORQUE: The Technical Magazine



Hi all,

You might already know what this magazine is about and how it started. So let's skip that part. I hope, we, in the coming years can keep up with this magazine and make it a mark of pride for all of us. But one should realise that this is a Technical Magazine which shall run by "your" contribution. This magazine is the product of our full capacity and we hope that you would all make efforts in the future to keep this magazine alive. I want to extend my gratitude to all those who helped make this very first issue of TORQUE possible. Finally, we would like to thank you, readers, who have decided to go through this creation of ours.

Hope you enjoy reading this edition of TORQUE.  
Go ahead and feel the TORQUE!

## ADESH KUSHWAHA

Editor-In-Chief  
TORQUE: The Technical Magazine

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# SIXTH SENSE/ TECHNOLOGY

**I**ndia has been a land for inventions. We have had many brilliant and imaginative inventors in the past. Our great nation has been blessed with people like Aryabhatta, Ramanujan, C.V. Raman etc. Pranav Mistry is the latest addition in the long list of names.

Pranav Mistry is currently the Global Senior Vice President of Research at Samsung. However, he is most renowned for his Sixth Sense Technology.

Humans beings have five senses, which are the tools that we use to understand what is happening around us. All of these senses interact only with the physical world. None of them has direct interaction with the digital world. That's where the Sixth Sense Technology comes in. It bridges the gap between the two worlds.

We are spending most of our time in the digital world. It is much bigger than the world around us and is continuously increasing. Hence it is imperative that we have a tool to increase our efficiency in dealing with it. Everybody remembers the cool way Tony Stark projects everything in the Iron Man franchise. Well, now the movie guys have a task on their hand because that technology is what precisely Sixth Sense is.

Pranav Mistry describes this as the following :

"Sixth Sense is a wearable gestural interface that augments the physical world around us with digital information and lets us use natural hand gestures to interact with that information." This technology is an integration of various other technologies such as gesture recognition, image processing, movement tracking etc. The prototype requires a camera, a projector and minor components which are easily available in the market.

The way it works is as follows. An image is projected on a screen. It can be anything- a wall, hand, table etc. Our finger is covered with some coloured markers. The motion tracking camera tracks the movement of our fingers on the screen and then performs various operations. For example, say a phone dial is projected on our hand. When we press the numbers, the camera will recognise it and will make the call when we press the call button. Sometimes we don't even require a screen. We can make a particular gesture, and a photo is clicked. There are similar gestures for zooming in and out, swiping etc. All of this is possible because of a software that tracks the movement of our fingers and interprets them using the predefined settings and performs the task.

This technology has wide applications. The fingers can be used as a brush, and the user can draw with it. Since a camera is present in the fields, it can be applied to just increase exponentially. Google lens uses this technology where it scans through the phone camera and shows the results. It can be used as a replacement for one of the senses for physically challenged people.

The greatest thing that Pranav has done is that he has made this software, open source. In this way, developers can modify it according to their demands. This is a path-breaking innovation which could change the way we have been living our lives. Many new inventions would be based on this and all of this would be credited to a brilliant inventor.

BHAVYA GUPTA

B.Tech '18/ Chemical Engineering

# FATHER OF INDIAN ENGINEERING

The 15th of September is celebrated as Engineers' day in India. On this day, Sir Mokshagundam Visvesvaraya was born. He was an exemplary engineer and an epitome of hard work who was awarded multiple accolades throughout his life. He received multiple honorary degrees, was knighted as Knight commander of the British Indian Empire and also received the highest civilian award given in India, the Bharat Ratna.

His life began in 1861 in Muddenahalli, Karnataka. His father, M. Srinivasa Sastry was a school teacher and his mother, Venkatalakshamma was a homemaker. Visvesvaraya lost his father at very a young age, but this did not deter him from continuing to study. He got his first degree, a Bachelor of Arts, from Central College, Bangalore. This was followed by an LCE, Licentiate in Civil Engineering from the College of Engineering in Pune. After finishing his second degree, he began working in Bombay's Public Works Department (PWD).



Visvesvaraya received his first patent in 1903, while he was working on the Khadakvasla reservoir near Pune. He invented an automatic floodgate system that worked extremely well that it was implemented in the Tigra Dam in Gwalior and Krishna Raja Sagar Dam in Karnataka. He built the latter despite opposition from the Madras Presidency. The dam, located in Mysore, was built as a consequence of people migrating to neighbouring districts in the summer to escape the existing drought-like situation. The dam was funded by the Raja of Mysore but, because the funding was limited, Visvesvaraya decided not to use cement for construction. Cement used to be imported at the time and would increase the cost exponentially. Instead, they used Surkhi mortar, a substitute which could be produced in India and to this day, the dam is the main source of water for the Mysore district.

Visvesvaraya was a man who believed in learning throughout ones' life. Following his retirement in 1908, he travelled the world in order to learn cutting edge engineering techniques of the time. During his expedition, Hyderabad was hit by rainfall after a

cloudburst which lead to the nearby river Musi to flood the city. The floods killed over 15,000 people and displaced a quarter of the city. The then Nizam of Hyderabad, Mahboob Ali Khan requested Visvesvaraya to implement a flood management plan. With his usual thoroughness, Visvesvaraya began by studying rainfall patterns in not only Hyderabad, but both Bombay and the Madras presidency. Only after he had completed the background research, he began the engineering part. His flood protection system was impeccable and for the first time, Hyderabad did not have to live in fear of floods.

In 1912, he was appointed the Diwan of Mysore. During his tenure, he promoted growth in all departments. He was especially instrumental in industrialization and in the Public Works Department. He retired from his position as the Diwan after 7 years following which, he served as a board member in Tata Steel till 1955. Visvesvaraya was a man known for his dedication and management of time, both rare qualities to possess. These are qualities that every engineer should inculcate in their life. He died in Bangalore at the age of 101 and a memorial of remembrance has been erected in his hometown of Muddenahalli in order to keep his legacy alive.

## DHYANESH BHASKARAN

B.Tech '17/ Material Science and Engineering



BBC Hackathon on Fighting Fake News: Held at Google Campus in Gurgaon on 14th-15th November 2018, skilled media professionals, fact-checkers, and IIT students from across India spent two days prototyping solutions to an element of the fake news ecosystem, with travel and accommodation expenses covered by the organizers. IIT Gandhinagar students Vraj Patel, Rushil Shah, Pranjali Jain and Sharad Joshi won the hackathon! The team of Pranjali Jain, BTech, Computer Science and Engineering, IITGN and Sharad Joshi, PhD, Electrical Engineering, IITGN won in the category of 'A system to find the source of the fake news'. The other team of Rushil Shah, BTech, Computer Science and Engineering, IITGN and Vraj Patel, BTech, Computer Science and Engineering, IITGN, won in the category of 'Image and text fake news category'.

The following students from IIT Gandhinagar were selected to be a part of the hackathon:

Ayush Garg (B.Tech '16)

Nidhin Harilal (B.Tech '17)

P. Jayakrishna Sahit (B.Tech '16)

Vraj Patel (B.Tech '17)

Shah Rushil (B.Tech '17)

Anubhav Jain (B.Tech '17)

Naman Jain (B.Tech '16)

Pranjali Jain (B.Tech '16)

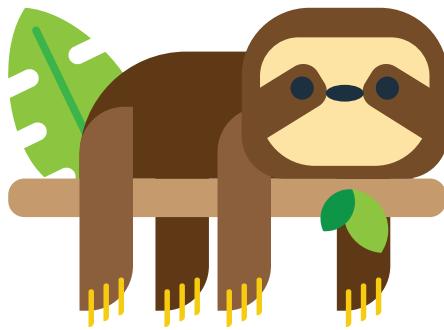
Sharad Joshi (PhD '15)

Rithwik KSV (B.Tech '16)

Sai Praneeth Maddi (B.Tech '16)

Raunak Swarnkar (M.Sc '18)

# LAZINESS/ THE FAULT IN OUR/ GENES/



ARPITA SANJAY KABRA

B.Tech '18/ Mechanical Engineering

Mumma says, "Get up and do something", and here we get a long list of errands to run for. Gathering all the courage left after hearing these ruthless words, we put all efforts to come out of the comfort of that cosy bed. Everyone perceives that being lazy is highly dependent on the will power of the person, a prevalent adage, 'its all in the mind' is all that we get to hear. Is it really the fault of a lazy person in being lazy? Or is this a mischief played by genes?

It has been found that a neurotransmitter named dopamine is involved in controlling a few emotional aspects of the human mind, like motivation, enthusiasm, desire to accomplish something, etc. We tend to reward ourselves on doing something great, on excelling or accomplishing something. This reward is in the form of fulfilling desires and cravings, like for good food. Dopamine induces the longing for fulfilling these desires. Even exercising is a pretty good achievement! This increases the dopamine levels in the blood and we feel like doing physical work again and again. Now, exercising isn't a passion for all, unlike food. This touchstone is determined by our genes.

Dopamine is synthesized by various proteins present in the body. Further, the secretion of proteins and their synthesis is controlled by the gene factor. Every individual has a unique rate of metabolism, which is passed on from generation to generation. Thus, these genes strengthen from each passing generation and are reflected more prominently. Dopamine secretion also follows the same rules of evolution. An experiment was performed on two different mice in which one is able to run longer than the other. After around sixteen generations, the offspring of the variety of longer running mice ran twice longer than the other variety. This experiment tried to emphasize the fact that laziness, or more precisely, inactiveness is a genetic characteristic and not determined solely by phenotype.

Dopamine receptors are controlled by genes. The 'couch potato gene' amusingly named so, is the gene which inhibits the dopamine receptors, this curtails the effects of dopamine on the mind. Does this mean that a lazy person shall remain lazy forever? This might give a panic attack to my Mom.

The human brain develops and changes continuously for the whole lifetime. This is known as 'brain elasticity'. Over time we experience different cultures, opinions, events and derive our own conclusions and impressions. These experiences change over the years and our brain responds to it coherently. Our emotional balance and thought process are never constant. Even injuries bring minor or major changes to the brain. This difference might occur in a single neuron only, but it does occur. These cerebral changes may also increase dopamine secretion, making us feel elated and euphoric. Tyrosine-rich foods also support in improving dopamine levels. Therefore, to all those people out there whose moms' think them to be lazy, its time to push ourselves out of the cosy bed, out of that fleecy quilt and prove our moms we are not lazy. After all, we have the energy to challenge our genes!

# ELEVATORS MOVING BEYOND UP AND DOWN

**R**emember the glass elevator in the movie Charlie and the chocolate factory? The elevator that Mr. Willy Wonka used to move throughout his factory. Well this idea is now not limited to the screen and in fact is implemented inside a purpose built innovation test centre in Germany. The revolutionary discovery is made by Thyssen Krupp.

Vertical Elevator has always been a very underrated invention. Remember it solved the issue of space when the population of earth was just increasing. It has not always got the credit it deserved. However the magnitude of this innovation is too big to get ignored.

The cabins are magnetized and they move on a magnetized track. Using the linear motor technology the cabins move up one shaft, travel horizontally and then come down another in a continuous loop. The elevator is known as multi. It is said to have 50% higher transport capacity and reduce power demand up to 60%. Also since it does not run on cables it requires less space than the conventional elevators.

What's great is that a real estate company has already agreed to be its first customer. If successful then the change in the architecture and design industry would not be anything like we have seen before. Be ready to see a significant change in the way we live.



BHAVYA GUPTA

B.Tech '18/ Chemical Engineering

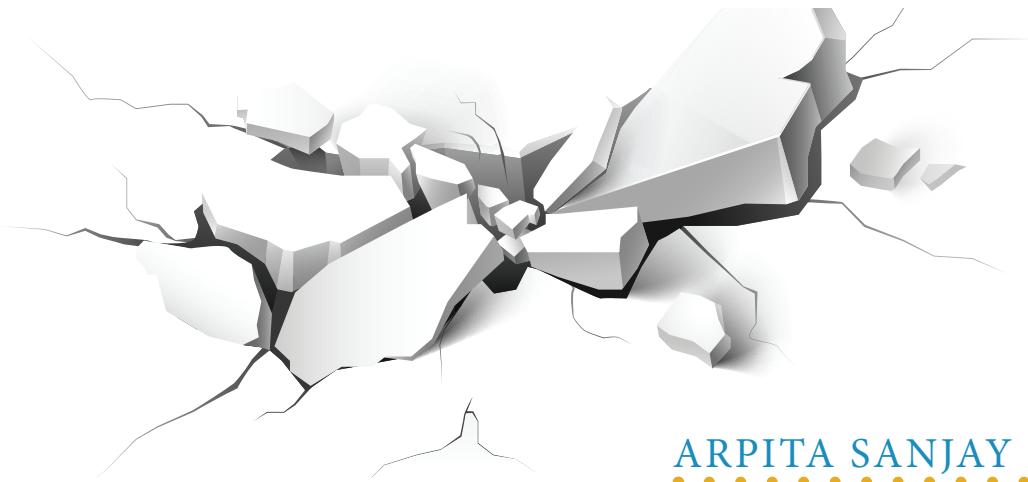


The third contingent of IIT Gandhinagar won gold and bronze for the first time ever at the Inter IIT Tech Meet held at IIT Bombay from 18th-20th December, 2018!

Gold in BETiC Medical Innovation Challenge. The team comprised of Shireesh Shelke, Saurav Muneeshwar, Akshay Biju, Vedanta Krishna Bhutani, Maitreya Thakur and Janvi Thakkar. The team worked upon developing a low cost spoon, called Neutra-spoon for Parkinson's' patients.

Bronze in The Eye in the Sky: The team comprised of Mrinal Anand, Rushil Shah, Rithwik Kukunuri who worked upon the research problem of satellite image classification.

# WHEN SEISMOLOGY GETS INTELLIGENT



ARPITA SANJAY KABRA

B.Tech '18/ Mechanical Engineering

Technology has become an inseparable part of every small aspect of life. Governmental organisations, security forces, the education sector, meteorological department, food and agriculture, the sector of production and services, invest in the latest technology to bring in precision, accuracy and the best quality.

One such area is in Natural Calamity Prediction. Often natural calamities lead to deaths, loss of infrastructure and livelihood. Earthquakes are nature's one such random call, the ring of which brings despair and hopelessness to all.

Harnessing artificial Intelligence and machine learning is an integral part of upcoming technological solutions. Earthquake prediction used to be highly unpredictable because seismologists and environmental scientists found it difficult to trace the exact movements of the tectonic plates. The process of conceptualising and further implementation of artificial intelligence in earthquake science is being undertaken. This would aid the rescue team in prioritizing their operation. It is a very difficult task for the rescue team to identify the intensity of destruction in different zones of the affected regions. The application of neural networks and machine learning has the capability to indicate the extent of casualties on the map of the region obtained from remote sensing technology. An earthquake is often accompanied by aftershocks, which can be more fatal than the original quake. AI and Machine Learning techniques help in identifying the epicentre of the aftershock accurately.

In order to do so, thousands of earthquakes are studied and analysed, the behaviour of rocks and plates is observed in detail, historical facts and a large amount of data from previous seismological events is collected and trained using neural networks - a specific machine learning architecture of interconnected matrices, to obtain optimal and real-time outputs for emergency situations.

For prediction of aftershocks, the region is split into a grid. Every grid is assessed individually as a point of origin of an aftershock, instead of an intermediary medium for passing previously generated seismic signals. Phoebe DeVries, a Harvard scientist, is working on precisely identifying the aftershock location. While Coulomb forecasting method might fail at times, the use of AI has improved the certainty to more than 80%.

# MEET OUR PROFESSOR

## NIPUN BATRA

Assistant Professor

Computer Science and Engineering

Professor Nipun Batra works in the field of computational sustainability where he believes that machine learning and sensor systems can enable us to optimise existing systems to help create sustainable environment. He has published various findings in distinguished conferences and is also actively working on multiple projects in the following fields: air pollution, water and energy scarcity, among others.

### 1.What are your views on the growing use of technology?

I think technology in the right hands and given the right expertise can definitely be a boon for us, however on the other side: in the wrong hands and with the wrong expertise could set things in the wrong path.

### 2.What were the events in life which motivated you to take on your field of research?

I remember when I was a kid, I used to hate missing T.V. shows due to power outages. Having had days when I used to study under a gas cylinder, I better appreciate what it is to have these basic necessities which a lot of households across the country don't have access to. The bollywood movie Swades also left a deep impression on me. I believe each of us can do our part in conserving resources and bring out about a change towards sustainable development. Finally, I'd like to quote Gandhiji - "there is enough for everyone's need, but not enough for a single man's greed".

### 3.What are your views on a college having a technical magazine?

I think magazines are something which make you nostalgic when you open them a few years down the line, especially when your contributions are a part of it. I love going back and reading articles I contributed to the school magazine!

I think a technical magazine brings us closer and sparks more collaborations. It also acts like a log, giv-

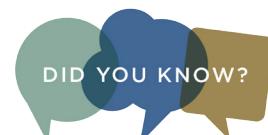
ing us a timeline of what is going on in the community, and can thus be used to measure progress.

### 4.What are your views on the technical culture of our college?

I really appreciate the effort students into putting up student run events such as Amalthea and Ignite. The quality of people brought during the events really speaks about it. I would love to see more interdisciplinary work.

### 5.What are some things you enjoy doing in your free time?

I like watching and playing sports, in particular football. I have recently gained an interest in gardening which teaches me how sometimes things need time and will eventually take its due natural course. I also enjoy cooking, which I picked up during my stay outside India.



The Milky Way moves through space at a velocity of about 552 kilometres per second (343 miles per second) with respect to the Cosmic Microwave Background radiation.



# THE SCIENCE BEHIND INTERSTELLAR

Interstellar has been one of the best science fiction movies of all time. It captures the most bewildering science phenomena and weaves them into a complex, emotional and engaging storyline. The movie has everything that a science fiction fan would long for from black holes and wormholes to time travel. What makes Interstellar different from other science fiction movies is the fact that much of the science shown in the movie is actually true. The images of black hole and wormhole shown in the movie were computer generated images of what our current theories predict about the appearance of these cosmic objects.

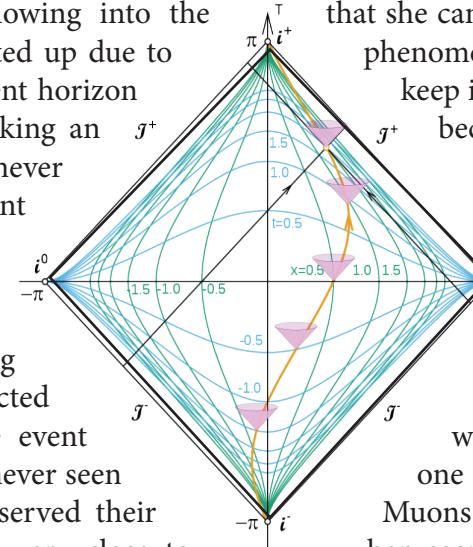
The Cooper's world in the movie Interstellar is set in the near future when a combination of various catastrophes has caused a shortage of food and as a result, humans have become a largely agrarian society. The primary problem is blight which is spreading from crop to crop and destroying them. Can blight be so lethal, that it

endangers the existence of human race as is shown in the movie? Many biologists believe that there is a possibility that a certain pathogen might become so deadly that it starts wiping out entire species of plants. One such event happened around 2.5 billion years ago, when a new life form called Cyanobacteria killed almost all life on Earth by releasing oxygen into the atmosphere. Back then, the Earth's atmosphere didn't have free oxygen in it as it does today. The oxygen respired by the cyanobacteria was a poison for all other life (anaerobic bacteria) on Earth. It was the Great Oxygenation Event.

In the movie, Cooper and his team visit a planetary system in which planets revolve around a massive black hole (Gargantua). There is a common misconception that black holes are like cosmic vacuum cleaners that suck everything that comes near them. In reality, black holes act just like normal gravitational masses. So a spaceship

or a planet or a cat can safely orbit a black hole at a safe distance just like they would orbit any planet or a star. Black holes can have their own family of planets, but the planets in such a system would be frigid cold because black holes do not radiate anything (Stephen Hawking showed that black holes should radiate some radiation termed as “Hawking radiation”). Things tend to change as one moves closer to a black hole. All black holes have a boundary called “Event Horizon”. Once something crosses the Event Horizon it can't return back, however hard it may try. Event horizon is like a boundary which separates what is inside the black hole from the external universe. Nothing happening inside the event horizon can affect the outer universe in any way. The movie shows the black hole as a pitch black spherical object which is surrounded by a disk of hot glowing material called as accretion disk. Stellar material flowing into the black hole glows when it gets heated up due to friction but once it reaches the event horizon it simply disappears (Strictly speaking an observer outside a black hole can never see something crossing the event horizon because time literally freezes at the horizon!). We cannot peek inside the event horizon of a black hole because light rays moving towards a black hole can't be reflected back (Nothing comes out of the event horizon, not even light). We have never seen a black hole directly but only observed their gravitational effects. Now, we are very close to getting our first peek at the event horizon of the black hole which is at the centre of our own galaxy, the Milky Way. The Event Horizon Telescope is an international collaboration aiming to capture the first image of a black hole by creating a virtual Earth-sized telescope from a network of radio telescopes.

The movie interstellar also depicts the mind bending idea of time travel. At the end of the movie, when Cooper finds himself at the “Cooper Station” he discovers that a lot more years have passed for the people on the station as compared to the amount of time that he has spent on his voyage to find potentially habitable planets. In fact his own daughter has aged much more rapidly than he has and as a result she has become much older than her own father! So, has Cooper travelled through time to arrive in the future? Well, in a sense he has. However strange it may sound but the laws of nature do allow different observers in different reference frames to experience



time at different rates. A cat riding a spaceship and moving at a high speed (close to the speed of light!) with respect to you will experience time at a much slower rate. She would not notice anything peculiar about the flow of time in the spaceship (unless of course she looks out of the window and discovers that it is actually your clock that is running slower as you are the one who is moving relative to her!). You might argue that if our cat is intelligent enough she might use her heartbeat or pulse to find out that her clocks are malfunctioning but actually there is nothing wrong with the mechanisms of the clocks that you are using or the cat is using. Time in itself is flowing at different rates for you two in a fundamental way. So, relative to you, not only the clocks on the cat's spaceship, but also her heartbeat, her metabolism and everything else that she can use to measure time runs slowly. This phenomenon is called as time dilation.

We should keep in mind that the effects like time dilation become noticeable only at relativistic speeds (speeds comparable to the speed of light).

We still do not have the technology to build a spaceship for our kitty that can approach light speeds.

So then how do we know that time dilation actually takes place?

Scientists have found many phenomena which point out that time dilation is real, one of them being the detection of muons.

Muons are strange particles which are formed when cosmic rays strike the gaseous atoms in our upper atmosphere. Muons have a half life of only 1.5  $\mu\text{s}$  (Half of the muons formed would decay every 1.5  $\mu\text{s}$ ). At such a high decay rate, we should not detect any muons at the Earth's surface, but scientists have detected these particles. So, how is it possible? Well, muons travel at speeds close to the cosmic speed limit (the speed of light) and hence experience time more slowly with respect to us (moving clocks run slower). As a result their half life increases with respect to us and our detectors are able to pick them up. It's relativity folks!

In the movie, Cooper and his team discuss that every hour that they spend on the Miller's planet would be seven years back on Earth. This sounds pretty mind-boggling. This happens because time flows slower in a region where gravitational field is stronger.

Now since Miller's planet orbits very close to the black hole, the strong gravitational field causes time to flow much more slowly as compared to a region which is far away from the black hole. You might now wonder if we can ever observe this mind-boggling effect in our daily lives. Well if we had not accounted for this time slippage, our GPS system would fall apart within a few hours. The GPS device in our phones receives signals from several GPS satellites out there in the orbit. The device calculates its distances from these satellites by using the time it took for the signal from the satellites to reach the device. Thus, GPS requires accurate timekeeping. Remember that the satellites in the orbit are moving relative to us at high speeds and they also experience a different gravitational field. So, the clocks on the satellites would tick at a different rate as compared to the clocks on Earth. This time slippage due to relativity has to be accounted for. Thank relativity and Albert Einstein the next time when GPS helps you find your way out in a new city.

In the beginning of the movie, it is shown that some other intelligent life form referred to as "they" has created a wormhole near Saturn which has brought a number of potential habitable planets within the reach of humans. A wormhole can be visualized as a tunnel with two ends, each at separate points in spacetime. Wormholes are predicted by Einstein's theory of general relativity but still they exist only inside mathematics. We are yet to spot any wormhole which could allow us to travel to a far off galaxy.

The ending is the most bizarre part of the entire movie. In

the end we see Cooper falling into the black hole. Since nobody currently knows what lies beyond the event horizon of a black hole, the makers of the movie use their imagination. We see Cooper inside a strange three dimensional space-time in which he can traverse the time dimension just as easily as he can move through the three space dimensions. Cooper uses this to his advantage to relay quantum data to his daughter. If your head has not started spinning yet, you have not given enough thought to this bizarre idea. In such a strange form of space-time, past and future are just as real as the present. It means that past does not vanish after it has happened and future is not something which is about to happen. They always exist just like the present does. The theory of relativity actually treats time as a fourth dimension and according to this theory we live in a four dimensional spacetime. Think of it this way, to invite a person to an event you need to provide the location (the spatial coordinates) as well as the time of the event.

All the crazy relativistic effects defy human intuition and are quite difficult to observe experimentally. Were it not for the likes of Einstein and other great physicists and mathematicians, we would have never had uncovered this strange aspect of reality. Isn't it amazing that such a small amount of grey matter inside our heads enables us to uncover the hidden aspects of reality just through sound reasoning and logic, and also allows us to create masterpieces like the movie 'Interstellar'.

## ABHISHEK RAGHAV

M.Tech '17/ Material Science and Engineering



Karthik SK and Kratika Bhagtani achieved 2nd position in Invention factory held at IIT Gandhinagar during summer 2019. They worked upon building a CPR Device prototype for treating cardiac arrest.

&

## SOURAV MUKUL TEWARI

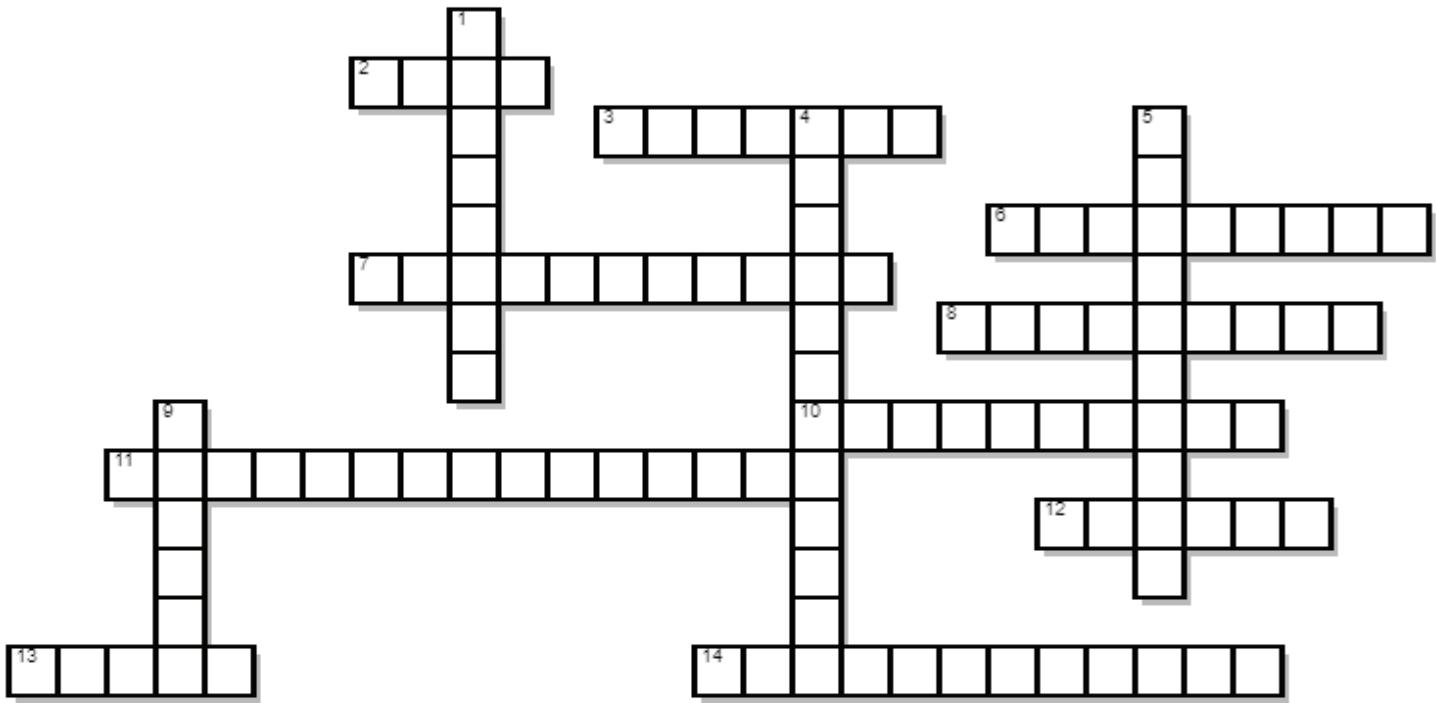
M.Tech '17/ Mechanical Engineering



In space, astronauts cannot cry because there is no gravity and tears can't flow.

# CROSSWORD

## SCI-FI MOVIES



### ACROSS

- 2. The title character is over 10 million years old.(4)
- 3. ISRO sent 104 satellites in half the cost of the production of the movie. (7)
- 6. This movie had an open ending which led to various theories. (9)
- 7. Based on the book 'Do androids dream of electric sheep.' (11)
- 8. A trilogy with a great first movie and below average two sequels. (9)
- 10. The idea came from director's nightmare. (10)
- 11. One of the earlier titles of this movie was 'Spaceman from Pluto'. (15)
- 12. This movie is 40% realistic and 60% CGI. (6)
- 13. This movie idea was the basis for Pitch Black. (5)
- 14. First Hollywood movie to be dubbed in Hindi. (12)

### DOWN

- 1. Contains the famous line "I have a bad feeling about this." (8)
- 4. The apocalyptic earth setting is based on Dust Bowl Disaster. (12)
- 5. The Mars exterior in this movie was shot in Wadi Rum, Jordan. (10)
- 9. The title character was played by the guy who voiced R2D2. (6)

# 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

“ Metis has always been a special place to me. I always thought of it as a good place to interact and learn from my peers who share common interests. In my first year, I was assigned a project about which I had no clue whatsoever. My team members were also in the same situation. So we all decided to learn and work together to finish the project. Many things I'm familiar with right now are the ones that I learned with the help of my peers at the club. This year we have engaged in various kinds of activities that help and promote the coding culture of the campus. Workshops on Web Scraping, Web Development, GitHub and Django were held in June year. We also made some changes to the mentor body of the club, so that beginners can explore their field of interest without hassle. By the end of my tenure as Metis Secretary, I want all the students in IIT Gandhinagar to look at Metis as a place to learn something new and build something cool.”

-- Rithwik Kukunuri, Metis Secretary.



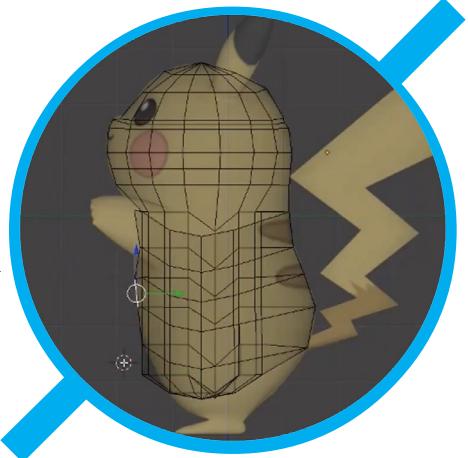
## ODYSSNEY

The Astronomy Club has gained quite momentum in the recent times. Equipped with powerful lenses, lasers, reflecting and refracting telescopes (with generous contribution by Prof. Kaustubh Rane), equatorial mounts and other instruments, the club has been a hub of astronomical activities. With performing wonders in National Students' Space Challenge with talks on astronomical phenomenon like orionid meteor showers, along with star gazing sessions, the club is spearheading the efforts to attract and generate interest in the field of astronomy. The skywatch session by Mr. Samir Dhurde from Inter-University Center for Astronomy & Astrophysics, Pune, included much exciting information, including spotting nebulae, a tough spotting in the night sky! The club also gave avenues to explore gravitational waves in its initiatives. Club trips, telescope building sessions and many more initiatives are future plans packed in line! The club also conducted the first ever club trip to Polo Forest- a delight for the astronomy enthusiasts!



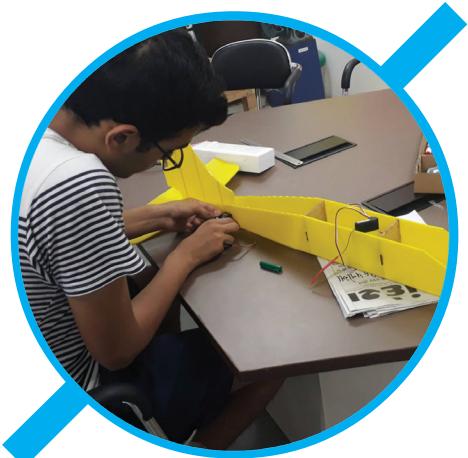
# DIGIS/

DigiS, IITGNs' game development club has had quite an eventful year, they have been completed numerous exciting projects. It begins with a first-person shooter game, the game possesses a vast and beautifully designed terrain on which the player has to shoot legions of enemies. They have also developed a flight simulator in which the player can dogfight other aircraft's in a battle to rule the skies. Recently retro-styled games have been making a comeback, games such as cuphead provide a sense of nostalgia with their old school graphics and music. DigiS has made a retro-platformer where the player gets lost in a mysterious planet and has to battle hordes of aliens to survive. They plan to add a storyline and even a boss fight. DigiS has not only worked on games for entertainment but has also been involved in creating a game to aid the recovery of stroke patients. Though further details could not be revealed it certainly does look promising. DigiS also took initiative to create tutorials for people new to the field. Using advanced software like Unity, Blender and Unreal Engine, DigiS also facilitated setting up similar clubs in other IITs such as IIT Madras and IIT Guwahati as well!



# MEAN MECHANICS/

Believing in the philosophy of “Learning through Application”, the Mean Mechanics club plays a crucial role in inspiring and creating curiosity towards robotics and mechanics. The club members are the heart of the robotics centered activities in the college. Autonomous underwater vehicle, first aid delivery using drones, a bot for our very own campus are some of the projects the students are working on. The club also took initiative to raise the bar of the robotics field in its general activities. A hands-on session on V-REP and ROS (Robot Operating System), the combination that enables one to test the correctness of algorithms and shaping ideas without even needing the materials in hand! The club is open to ideas to take it forward and to providing projects to students to work upon. An exciting build-a-thon is a future activity planned for the entire student community: come and indulge in Robotics!



Butterflies taste with their feet.

# COLLEGE/ ACTIVITIES

## • • • • • • • • • • • • • • • • AMALTHEA

Amalthea, the Annual Technical Summit of IITGN is a completely student-run event, managed by undergraduate sophomores and freshmen. Its 9th edition was organized on 20th and 21st October 2019 on the lines of the theme, “Integrating Technologies”.

This year, we had a great lineup of speakers from different areas of technology. Mr Kush Saxena, Global Chief Technology Officer (CTO) of Mastercard, Dr Alok Nath De, Corporate Vice President of Samsung R&D India, Dr J.N.Goswami, Moon Man of India, Mr Trishneet Arora, popularly known as “India’s Mark Zuckerberg”, were some of the prominent speakers. Indian Army, Kasperob Robotics and Automation, Play Station VR were some of the prominent exhibitors at the summit. A special seminar on robotics was held which featured a talk by Prof. Ashish D.Deshpande, Director of the ReNeu Robotics Lab at the University of Texas at Austin, on “Intelligent Robotic Exoskeletons for Rehabilitation”. This year a new event called Brinwiz was introduced for students of classes 9-12. Amalthea also organized a special talk for the management aspirants on the campus. Prof. Anurag K. Agarwal of IIM Ahmedabad gave an interesting talk on “Business, Government and Law”. This talk was organized exclusively for IITGN students.



## WINTER/ PROJECTS

The Winter projects taken up by the students proved to be an effective way of utilisation of their time. They provided them with knowledge in the areas of their interest and moreover, they had some hands-on experience with the technical tools. They had to collect information and learn the methods of implementation on their own and this made them experience the problems which one actually faces while implementing the concepts. At the end of it, they came up with a working project, for example, a programme or an application designed for androids. Winter Projects are an ideal way of curiously learning stuff, exploring the field of interest and implementing the same.

The winter projects are carried out under the assistance of the technical council, which guides and provides help to the participants for the entire duration. If participants get highly interested in their project, they can still work upon it further in the continuing semester. The main objective of winter projects is to make students realize where their interest lies. The December chills should be ignited with something very interesting and exciting, as are the winter projects.

## Participants' Words:

What's better than exploring the field of your interest in free time! Taking up the winter projects is a great opportunity for the students of IIT Gandhinagar to explore various domains in the area of technology, and if possible build a small prototype. This is especially a great opportunity for all freshmen. I enjoyed learning about network security which we use in mobiles and various encryption techniques to keep the shared network protected. It was fun to get to know something about hacking! SQL injection is one of the most common hacking techniques used. Phishing, though illegal is a method by which unethical hackers obtain a lot of sensitive information from devices. Also, there are many software available online using which one can hack devices, accounts and access passwords, control working of the whole device, and even block the original user from using the device. Winter projects are a great way of utilising the one month break. It's the best way to learn something new and exciting.

**Arpita Sanjay Kabra**

B.Tech '18 / Mechanical Engineering

Winter Projects under the Technical Council gave me an opportunity to best utilize my time in winter vacations which I would have otherwise not utilized fruitfully. I had an eagerness to learn how to make android applications, specifically something which could connect people and share information within no time. So, I decided to build a real-time chatting mobile app in which a user earns rewards for messaging. I was a beginner in this field, but the technical support from the council and my own enthusiasm made my project successful. Through this project, I not only learned how to make mobile applications but also learned how to structure databases for getting information faster, how to optimize an algorithm and made my first open-source repository on Github. I would like to thank our technical secretary for giving me this opportunity to work and sharpen my skills in the field of my interest.

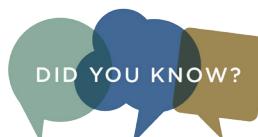
**Nishikant Parmar**

B.Tech '18 / Computer Science and Engineering

My project was about differentiating between grain size after every pass of ECAP. During the start of this project, I did not have much idea about my branch. This project helped me to learn about different areas close to my project. The main aim was to learn image processing. My mentor, Ayush Garg, helped me learn image processing. He helped me in figuring out glitches in code and letting me know about different features I can use. It was fulfilled satisfactorily. I studied about other processes as I continued this project. It helped me develop an interest in my core subject. It helped me increase my knowledge of different fields in which research is going. It helped me find my area of interest and gave me a push to start working on it. This project is related to many industrial applications where one needs to find the grain size of the particle. It is a big factor that governs many mechanical properties of an alloy or pure metal. It is useful in also seeing precipitate formation which is one method to increase the hardness of alloys. Though this project was solely based on Cu and its grain size, I also read about texture analysis of microstructure during different processes like torsion, severe plastic deformation, cold rolling, hot rolling and many more. This project in all helped me learn a lot many things and was very useful in finding my interest areas.

**Shuchi Sanandiya**

B.Tech '17 / Material Science and Engineering



The only part of the body that has no blood supply is the cornea of the eye. It receives oxygen directly from the air.

The winter project provided me with an opportunity to explore and learn the technical skills which have direct application in the real market conditions. Algorithmic trading proved to be an interesting topic to work on as it works directly upon the real world data. Accessing the stock market data using APIs (Application Programming Interface, which is set of procedures of accessing data in a program from an application) applying statistical algorithms upon it and analyzing the hidden trend was quite challenging. I basically used Python libraries to store and analyze the data and to present the output in a comprehensible manner. Thus the project was a good experience at the level of a beginner.

Shruti Prakash Gupta

B.Tech '18 / Electrical Engineering

## E-BAJA

Society of Automotive engineers BAJA is an event for colleges to design an ATV vehicle that can survive the challenges that the judges throw at them. This year was our colleges first attempt at this event, this meant they had the arduous task of making an ATV from scratch. The team was divided into five groups- brakes, suspension, steering, transmission and roll cage. They began by modelling their vehicle on software. Only after doing numerous virtual stress tests did they begin the building the ATV. Despite setbacks, they were able to complete the vehicle and set off on their journey to Indore. Bad news struck them in Indore where they faced technical difficulties on multiple fronts which led to their ATV not being able to perform. Vandit Goyal, a member of the suspension team said: " It was unfortunate that we were unable to present our car but it was a good experience to go there and look at the competition, I am sure we will be better prepared next time". As Winston Churchill aptly put it 'Success is not final, failure is not fatal: it is the courage to continue that counts'.



## PY-DATA

PyData Gandhinagar is the official Chapter of Gandhinagar. It was an initiative taken up by some of the BTech Students under the guidance of Prof Nipun Batra. Till date 3 meetups have been held, 2 at IIT Gandhinagar and 1 at DAIICT. The meetups are usually comprised of some talks and a hands-on session on some python tools like jupyter notebook and Pytorch. The talks were given by both Students and Professors. One of the talks was even given by people from S&P Global Inc

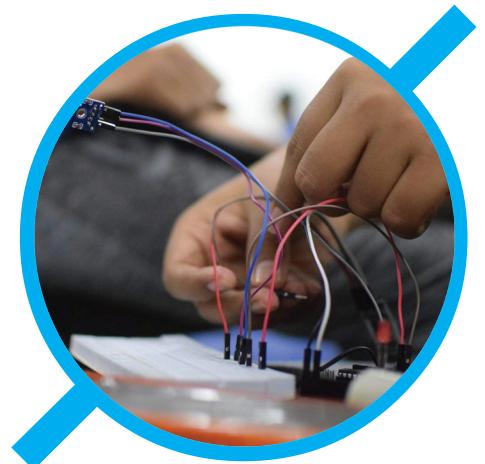


# /TECH STORE/

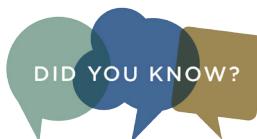
Tech Store is an initiative which aims at solving the problem of no hardware shop on our campus. We are trying to resolve the crisis and save time that is required to procure materials. Presently we are making a database of all the vendors in Ahmedabad. We are planning to run a shop which will give the required components on every weekend. You can mail us your requirements during weekdays so that we can arrange them for you. Team comprises of students from B.Tech and M.Tech. They are putting complete efforts to make this initiative successful and ease your life.

# /IGNITE/

IGNITE 5.0, the annual technical fair of IIT Gandhinagar was held on 16th-17th March 2019. “Rise from Within”, it is the final showdown of the various technical activities that happen round the year. Students bring out the best of what they engaged in throughout the year. Witnessing hands-on workshops by industry professionals from Autodesk and IBM, IGNITE 5.0 witnessed record participation from the community. Events like bot wars (with wireless bots first time ever), monorail and ATV were successfully conducted. A hologram developed by students was also the heart of the event!



For the first time ever, IIT Gandhinagar students Tejas Mehta, Manikanta, Karthik SK, Abhinav qualified for the finals of National Students' Space Challenge, conducted by IIT Kharagpur in association with ISRO. NSSC is the largest space fest of India witnessing participation from hundreds of teams from all over India. The students also performed wonders in the finals! Tejas Mehta and Manikanta Mandlem achieved 2nd position in NSSC Case Study while Karthik SK and Abhinav secured 4th position in NSSC Space quiz.



A teaspoon of neutron star would weigh 6 billion tons.

# INTER-IIT TECH MEET



The Inter-IIT Tech Meet 2018 was held at IIT Bombay this year from 18th to 20th December. Our contingent performed outstandingly well bagging 9th place among all the IITs and also bagged first ever gold in the Inter IIT Tech Meet. The unprecedented feat was accomplished by Shireesh Shelke and his team, they won a gold medal in Betic for designing a spoon for Parkinson's patients.

The spoon counteracts the vibrations produced by the patient and helps the patient eat their food without it spilling all over the place. The spoon works on a mechanism similar to that of a camera gimbal. The benefits of this design are numerous, there are no electric parts, it's easy to manufacture and most importantly it's cheap. The low price of the spoon means that it is a feasible solution for people of all economic backgrounds. The first event to take place was the Engineers' Conclave. It was a place for engineers to showcase the cutting edge research and projects that they have worked on. Anirudha Soni, a BTech Second Year Student who had presented his project in the conclave quoted ' It was an amazing experience, I was able to witness the marvellous research that is going in IITs. My favourite was the humanoid robot that IIT Guwahati was trying to make'. The Tata Center at IIT Bombay organized a challenge to make something for farmers that would reduce the drudgery in their lives. Our students made an economical rice harvester that derives inspiration from local farming practices. The case study team of IIT Gandhinagar came up with a plan to reduce plastic pollution by recollecting low-density packaging plastic and reusing and recycling them. Ajinkya Pawar and his team worked on the campus sustainability challenge, they planned to implement small spherical turbines in taps and pipelines. The team developed models and tested them on ANSYS, their effort is commendable as the mechanism which they worked on is relatively new. These turbines would generate electricity that would be sent to the power grid. The team consisting of Mrinal Anand, Rushil Shah and Rithwik Kukunuri won Bronze in Eye in the Sky. They were tasked with processing satellite images and identifying various landscapes. They used a combination of machine learning and image processing techniques to achieve a staggering 93% accuracy. Overall it was a great effort by the students and the seniors and Professors who helped them.

DID YOU KNOW?

The rate at which a person's hair grows doubles during an airplane flight.

The Students' Summer Technical Projects (SSTP) are technical projects offered exclusively to the students of B.Tech First Year in the summer vacations. SSTP is a programme meant exclusively for BTech First Year students to gain hands-on experience. The programme was devised to promote experimentation and provide students a platform to develop prototypes that would evolve as potential start ups. Honing serious techno-management skills, this intensive programme was initialized in 2018, with inputs from Student Leadership Conclave, organized by IITGN students. Often, we students get bored and indulge in no self-development activities at home. SSTP was initiated to enhance technical skills, incorporate problem-solving skills and optimally utilise the time. This was initialised in 2018. The teams which apply for SSTP undertake their projects in guidance and mentorship of the professors of the institute. They also receive fundings for the project, around Rs. 25,000 per team from the institute.



This initiative has resulted in tremendous learning for participants, improved interactions, exploring various ideas, and finally building a prototype. The students who participated in SSTP in 2018 created autonomous drones, and also provided home automation solutions. They also worked on autonomous underwater vehicle which serve the needs of Indian navy, work on which is being continued till date. This two-month long programme is an ideal opportunity for B.Tech First Year students to explore various technical domains and chose their work of interest.

We talked to one of the teams for SSTP comprising of Jethva Utsav, Vandit Goyal, Anirudha Soni, Rohit Patil and this is what they shared with us:

“SSTP was the most exciting and productive two months of my BTech first year during summer break. I learnt a lot of technical stuff about drone from building it from scratch and programming it autonomously. I also studied the dynamics of UAVs which helped me understand them much better. I also learned about PID controls of a drone and flight controllers.” - [Jethva Utsav, B.Tech '17 / Electrical Engineering](#)

“I worked on the project ‘Automated Drone Delivery of Medical Kit’ in the summer holidays of my freshman year under ‘SSTP’. The outcome of the project was defined but the procedure to achieve that was unclear to me and my team and that was the best part of the experience. As we planned our way with a considerable budget given in our hands, I learned many things in the field rotorcrafts and automation. As we were reaching towards our desirable product, we had certain system failures leading to crashes, but in the end, we succeeded in making an automated delivery system with a preliminary stage obstacle avoidance. I think SSTP is a great opportunity to explore areas of interest in the technological sense.” - [Rohit Patil, B.Tech '17 / Computer Science and Engineering](#)



In cases of extreme starvation, the brain will begin to eat itself.

# /TECH RADIO/

Tech Radio is one of the initiatives started by the Technical Council this year! Chai, nashta, and short talks by our own IITGN students at 2 Degree Cafe is what lightens up Tuesdays 11AM. But there is more than what meets the eye. The presenters learn the art of content delivery to variety of audience as well as it boosts their confidence. Bringing more visibility and providing more opportunity to network among peers working on similar interests within IITGN community, the initiative was taken to promote ability to pitch your work and also for continuity and scalability of projects.

The following teams got an opportunity to present in the series: Team Neutra Spoon, Team Eye in the Sky, Team Parikshit, Team Moksha, Weeding Device, Team AUV and Team GNius App!



# AIChe/

The AIChE IITGN Student Chapter started the academic year with AIChE Student Regional Conference, India. The contingent won multiple accolades at the conference. The Student Chapter then organised the orientation session for the first years. Further meetups with the freshmen resulted in a project by first year students on designing and fabricating an innovative control valve for centrifugal pumps. The new Chem-E-Car team of our student chapter is currently working on using an aluminium air battery for their car.



To spread awareness and importance of effective recycling, Student Chapter in collaboration with Prof. Chinmay Ghoroi organised workshop on Circular Economy by Ms. Pavithra Mohanraj, Founder and Director of Infinitive.

Student Chapter organised its Annual Event-2019 as a part of Ignite with the aim of giving practical exposure to Chemical Engineering students in terms of both industrial and core-concepts. The event consisted of following competitions and talk:

- a.Chem-E-Talk: Organised by Dr. Bharat Jain from Gujarat Cleaner Production on “Role of Chemical Engineers in 21st Century” to give idea to students of what kind of skill-sets are expected in industries.
- b.Chem-E-Solve: 24-Hour Chemical Engineering based hackathon designed with the goal of bridging the gap between industry and the academia in mind in collaboration with Infinitive Company.
- c.Chem-E-Quiz: The 1 hour Chemical Engineering core related quiz designed to test theoretical concepts of students.

# TINKERERS' LAB

One of the striking feature of Tinkerers' Lab IITGN that makes it different from other TLs around is the fact that it is completely student-run. Since its inception, the lab has housed various workshops and projects. The 3D printer and the Laser Cutting machine are two of the high-end machines extensively used by students. The introductory session for both of them is conducted by the TL team at the start of every academic year. Events and workshops are regularly held and a good amount of student participation is observed, to promote the spirit of tinkering. What happens when you have tinkerers and tinkering lab? As a part of How Stuff Works series, students broke apart projectors to understand how they function! Reverse Engineering a common feature found in the classroom, the TL team of tinkerers Amitha, Dip, Kaushik and Shivang put forth the activity for the entire community! The lab also featured overnight event iTinker in IGNITE 5.0, where a team of students tinkered around to build their prototypes to solve real-life challenges!



The AIChE IIT Gandhinagar Student Chapter participated at the first AIChE Student Regional Conference, India held at the Vellore Institute of Technology on August 11th and 12th, 2018. The IITGN Chem-E-Car team consisting of Shivam Singh, Jatin Dholakia, Dev Kakkad and Lakhan won the first place in the Poster Presentation Session of the prestigious Chem-E-Car event. The judging panel comprised of Mr. Umesh Dhake, the President of the AIChE Centre for Chemical Process Safety and Prof. Robert Ofoli from the Michigan State University. In addition to this, Khili Khamesra, a third year student at IITGN, won the 3rd place in the Academic Research Poster Presentation Session.

# MEET OUR PROFESSOR

## HARISH PM

Dean of Student Affairs  
Associate Professor  
Mechanical Engineering



### 1.What are your views on the growing use of AI?

Although there has been a tremendous use of AI and other such technologies, I think it is still hard to be able to predict the outcome of these right now and would rather take a certain period of time. A good example is the industrial revolution with a sudden surge in production and development of good, the immediate effect was a positive on, however over the years it's other effects such as Global warming and resource depletion surfaced up. I think it's an inevitable cycle of re-building.

### 2.What are your views on a college having its own technical magazine?

I think it's important for an institute to have its own technical magazine, mainly because it serves as a good communication tool about what's going in around our campus. This also address another issue - the issue of email fatigue: The large number of emails we receive each day sometimes causes us to ignore emails which happen to be of something informative.

### 3.What are your views on the tech culture in our campus?

I am extremely happy about it, in particular about how rapidly evolving the culture has been when compared to that a few years ago. I also think there has been a rise in the number of opportunities for students to participate in such tech activities.



Amit Reza, was awarded the top poster award at the LIGO-India conference held at Khandala, India. The title of his project was 'Random projections in gravitational wave searches of compact binaries'.

# I PRANKED A FRIEND USING MY KNOWLEDGE OF HOW HARD DRIVES AND FILE SYSTEMS WORK ....

Vraj Patel

B.Tech '17 / Computer Science and Engineering

This is the story of how I greatly inconvenienced him by using a python script which was just 3 lines of code



**L**et me start with a little bit of background. I will call this friend H. In general I don't like to create trouble for people, but this was different. One fine evening, while I was talking on my phone, H suddenly comes and tickles me making me drop my phone. As you can all imagine, my poor OnePlus 5's display couldn't handle the impact of a shoulder height drop (which could have as well been a floor height drop because I was standing at the edge of the the balcony). No one was at fault as H didn't know I was talking on my phone. But, I just couldn't let him go scot-free. I waited for a chance and a week later, it appeared.

H left his external hard drive with me because he wanted some files. I quickly typed the following code on my laptop, placed it in his harddrive and ran it.

```
# Code keeps creating files with integer names.  
# RIP is written in each file to pay respect to the drive.  
for i in range(1,10**10):  
    with open(str(i),'w') as file:  
        file.write("RIP")
```

(P.S.Now comes the fun part) After a while H returns and sees me playing with his hard drive and becomes suspicious. I let up a mischievous smile. He immediately unplugged the drive from my laptop and plugged it into his. Now his hard drive had around 300K files all named 1, 2, 3, 4.... .As anyone would do, he selected the files all at once and pressed delete button. These files were not more than a few megabytes in total but the estimated time shown was 30 minutes. This made it impossible for him to open his Recycle Bin to delete other large files that I had also placed in his drive. He had to finally spend 2 hours and use Ubuntu to delete the files. Mischief managed!

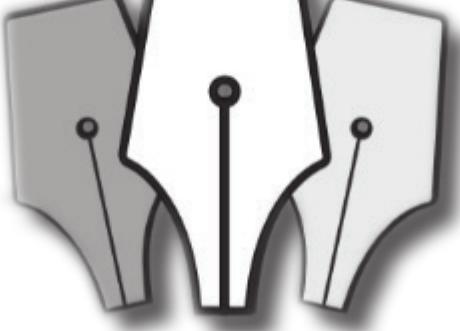
Let us see why this happened. When you write files, space is allocated to the file on disk and a corresponding entry is made in the disc of where the file is located. For large files, you may not have continuous space to store it so multiple entries are needed. What happens in delete and move operations is that either the entries are deleted or the file system location they correspond to is changed instead of actually moving or erasing of bytes. That is why you can quickly move files within the same drive but copying takes time as copying involves actual reading and writing of new data to the drive. So deleting 300K file entries takes a lot of time, but why was the Recycle Bin not opening? In Windows, when you delete a file, it is moved to a hidden folder \$Recycle.Bin. The files from this folder show up when you open Recycle Bin. Now, this meant that when H opened his Recycle Bin, it had to read 300K to gather related metadata for the GUI. That is why the Recycle Bin wasn't showing files as it was taking a long time to scan them.

To avoid all this mess, a simple command from Command Prompt would have done the trick but poor H, he didn't think smartly and was in a deep mess! He switched to Ubuntu and deleted the files which still took him a decent time.

The lesson learnt is that never leave your hard drives unattended :-P

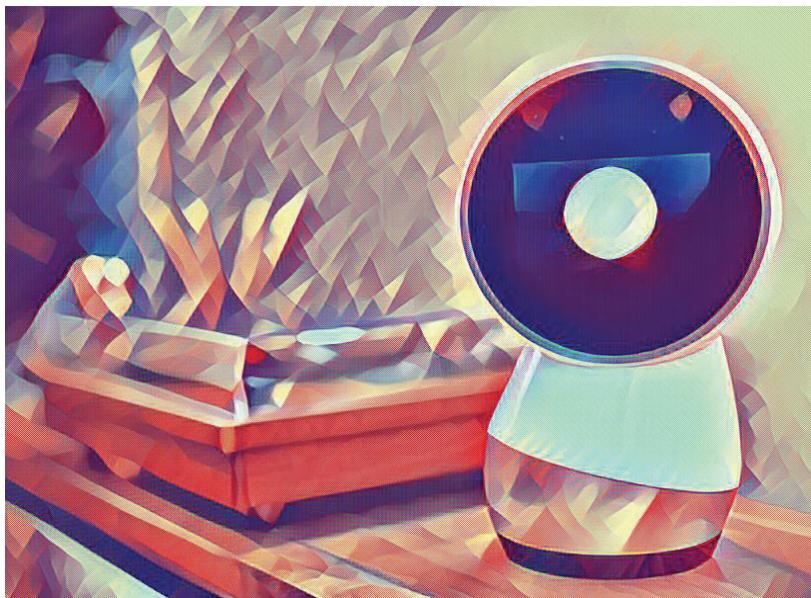


Amit Yadav, Manikanta, Shivang and Ankush cleared the first round of e-Yantra, the annual robotics competition organized by IIT Bombay in association with MHRD. e-Yantra Robotics Competition (eYRC) is a unique annual competition for undergraduate students in science and engineering colleges. The selection for hardware round consist of a online test on embedded system concepts, then 4 week intense 3 task for simulation cum automation round. Where skills in popular robotic platform like V-rep and ROS is developed and tested through task. In the simulation round abstracts of real world problems assigned as "themes" are implemented by the teams using these simulation platform. The team qualified for hardware round then implement these theme on actual hardware using the provided robotic kits. The themes are decided according to need of india. It is sponsored by MHRD under the National Mission on Education through ICT program. It is an IIT Bombay initiative to create the next generation of embedded systems engineers with a practical outlook to help provide practical solutions to some of the real world problems. Now in the next round team challenge is to complete the task of navigating the Hungry Bird(a drone) through hoops in the shortest time possible. The team worked on microcontroller programming, active perception, sensor interfacing, drone controller designing and path planning.



## BLOGGERS' SPOT

**L**et us introduce you to the rarest of the rare species of any technical institute-technocrats who are into creative writing and documentation. Under the Bloggers' Spot section we will feature blogs written by students. It can be on any tech-based topic. The budding bloggers and their pseudonyms are here for all! Follow us on :- <https://medium.com/@torque.iitgn>



### SMART HOME/ ASSISTANTS : NOW v/s THE WAY AHEAD

<https://amalthea.iitgn.ac.in/blog/2018/07/16/smart-home-assistants/>

**H**ome automation and smart home products are quickly gaining traction in the market. Among these are products

like the Google Home and Amazon Echo which are smart speakers. But they are not just speakers as we have known them to be. By providing an interface to virtual assistants like the Google Assistant and Amazon's Alexa these products end up being smart home assistants.

When home automation is carried out by using various products like smart lights, WiFi-equipped smart thermostats, and various DIY solutions you end up with the need for an interface to control and monitor these. While the device manufacturers do provide such interfaces, they don't feel as connected as the controls for different aspects will be spread across different apps. These smart speakers can take care of this by making the process for controlling your house simpler. They enable the use of simple and intuitive voice commands for interactions rather than cumbersome touch input. This makes your experience more seamless and meaningful. These smart speakers can also do other useful tasks like reading your daily news feed while you have breakfast, give quick weather updates for the day before you leave for work, set a reminder for an important task, or order groceries. Basically, you have a personal assistant at your disposal 24x7.

While these smart assistants are very capable and versatile and able to give very precise answers to your queries, sometimes they just fail to understand you. You need to be specific about what you want. Also, they are unable to parse the queries if they get slightly complicated. Then there is the issue of compatibility and lack of support with certain home automation hardware. These are some of the technical issues faced. But, there are also other non-

While using these smart devices, when you call them, they respond by simply lighting up. This doesn't give us the sense that they are truly listening. Nor does it quell the fear that they are spying on us while they are inactive. Also all the interaction with these devices are mostly all business and no fun. The approach taken by Jibo is a good precursor to what the future smart assistants must be capable of in addition to what they do today. Jibo is a humanoid looking bot which is aimed at being a companion rather than a home appliance. The Jibo is made to look cute with the voice of a 10-year-old to make people feel at ease rather than threatened by it. When you say "Hey Jibo!", he immediately turns to look at you and responds to you. You get a feeling that he is speaking to you than speaking at you and it makes all the difference. He can hold conversations and has a very definite personality. This is the way a smart assistant should be. Not just an assistant but a companion. Not just an appliance but a part of the family. The coming of these smart assistants is not just augmenting our lifestyle but also of changing it fundamentally. Children are now being exposed to technology at an early age and this can affect their social development. For example there is the concern that when a kid orders a smart assistant to do something and it always does what the kid wants, the kid might develop a bossy attitude. There are initiatives being taken by companies in this direction like Google's Pretty Please which urges and encourages children to add a please to their queries so that they learn to make a request rather than give a command.

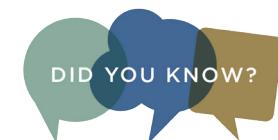
The devices and options available for smart assistants is evolving quickly due to fierce competition to take over this market segment. We should expect to see positive changes in the experience, enabling us to connect better with the technology in the coming years. Objectively the experience will always be the sum of its parts. But if the experience is meaningful and fulfilling for the user, then it will transcend that limit. Figuring out the form and modality of interaction that is the most natural will take a lot of time and effort. Let us wait and see how it all shapes up.

**alphatron99** aka Vraj Patel

B.Tech '17/ Computer Science and Engineering



Agribot is an Agriculture-Specific Question Answering system build on the dataset from Kisan Call Center robust enough to answer queries related to current weather, market rates, crop protection and government schemes. As of now, the system supports the English Language but we plan on extending it to multiple languages. This system can be accessed anytime, from any electronic device and supports voice recognition. At Vibrant Gujarat, the work was accepted to be published in the proceedings of the International Conference on STEM 2019. Out of 300 submissions, 30 papers were accepted and out of those 30 papers, best 3 papers were awarded cash prizes. The team won the 3rd prize (Rs 50,000) and received a chance to present our work at the conference (500+ audience). This award was presented by HRD Minister Mr Prakash Javadekar and other dignitaries in the Education Department of Gujarat. Team Members: Pratik Kayal, Naman Jain, Pranjali Jain, Soham Pachpande, Sahit PJ



If you taste the universe, it would taste like a raspberry.

# THE BEAM OF INVISI- BILITY



krē'ātiv aka Deepika Soni

B.Tech '17/ Electrical Engineering

<https://amalthea.iitgn.ac.in/blog/2018/09/23/beam-of-invisibility-could-hide-objects-using-light/>

We need light to see things around us. But wouldn't it be surprising if we could hide objects and make them invisible by hitting them with a "Beam of Invisibility"? Though limited to the spectral world of "Star Trek" and "Harry Potter," "Invisibility Cloaks" have always been fascinating to the ever curious human mind. And now scientists have developed a new technique that would make this futuristic technology into a defining reality.

To become invisible, an object must do two things: it has to be able to bend light around itself so that it casts no shadow, and it must produce no reflection. Theoretically "Invisible Cloaks" work by smoothly guiding light waves around object boundaries, so the waves ripple along their trajectories as if nothing were there to obstruct them. However, invisibility can be achieved via a different route as well. Scientists and researchers of the Technical University of Vienna (TU Wien) have developed a "Beam of Invisibility" that renders an object invisible!

Why do we see objects? Well, a light wave can enter and exit an object, but, it never passes through the medium in a straight line. Instead, it is scattered into all possible directions. This scattering makes things visible. However, if the original light wave is guided through the object as if the object was not there at all, it would become invisible! Though this sounds strange, scientists at TU Wien have made this possible using specific materials and unique wave technology.

Every object in this world has its own type of microscopic arrangement of atoms inside its lattice which is responsible for scattering the light when it passes through it. Owing to the difference in the microscopic alignment, scattering differs significantly. However if one shines the light beam in a pattern that correlates perfectly and accurately with the irregularities of the material, then this projection can effectively switch off the distribution, and the light beam can pass through the material unhindered and unscattered, making the object invisible for us.

The obvious and challenging hurdle was the fact that for every object in this world, a unique arrangement of atoms exists at the microscopic level. Every object that we want to make transparent has to be irradiated with its own specific pattern — depending on the microscopic details of the scattering process inside. Therefore, it seemed practically impossible to project a different beam of laser every time. However, the team of scientists at TU Wien developed a method that allows calculating the right pattern accurately for any arbitrary scattering medium. This "scientifically magical" technology is conceptually verified and is in-principle correct. Computer simulations have shown that the method works. For experimental verification, the acoustics are being used first rather than light waves themselves. This is because, experimentally, sound waves are easier to handle, and from a mathematical point of view, the difference does not vary significantly.

The most surprising aspect for the team of scientists at the TU Wien is that this concept works at all. There may be many more surprises for which the world awaits to experience when dug deeper along these lines.

With the unprecedented pace of the researches and breakthrough innovations, this scientifically magical technology will soon be a happening reality, making our lives interestingly mystified!!

# EXPLORING / THE / BLOCKCHAIN / TECHNOLOGY BEYOND / CRYPTOCURRENCIES /

manasbedmutha98 aka Manas Bedmutha

B.Tech '16/ Electrical Engineering

<https://medium.com/@manasbedmutha98/exploring-the-block-chain-technology-beyond-cryptocurrencies-6c3812e9148c>



**B**lockchain has been on every tongue ever since the Bitcoin boom a year back. The buzz has been on the rise since then. People buy, sell or “hold” (a common blockchain slang for holding) these coins or so-called cryptocurrencies. Some rise with the boom while some are waiting for their fortunes to click.

We often confuse Cryptocurrencies to be Blockchain, but blockchain is not just that much. More than currencies, Blockchain provides us a distributed ledger system to store data. By and far it is one of the most secure ways to make data untamperable. The idea is simple. Every data entry is stored as a block which contains the data and a hash, something similar to an encrypted id for a given block. Also, each block contains the hash of the previous block by consent of other people in the network. Thus each block is added to the next based on its previous hash forming a chain, and thus the name Block-Chain.

The consensus can be reached by different algorithms wherein each person has to solve a cryptographic puzzle (there are newer ones working differently as well!). The person adding the block pays a small fee while everyone verifying these transactions is given an award/incentive in terms of cryptocurrencies. This is where the likes of Ethereum, Bitcoin, Ripple, etc. come into the picture. Each has a different way of storing data, getting consensus and transaction style. For example, Bitcoin bases its purpose and focus on “Digital Money” while Ethereum works on Smart Contracts also helps build Distributed Applications (DApps) on its framework.

These days every system runs on data. The need for security of this data provides for amazing applications of Blockchain across every walk of our life. From primary purposes like storing land records and certificates to monitoring products across the supply chain and from finding counterfeit data to developing new financial instruments; this technology is being applied everywhere. Talking of Blockchain in Supply Chain, due to being tamper-proof, one can exactly see where a particular carton is right now, or when should he expect the delivery, thus helping save millions. The same concept could be put to use to monitor a person’s health across the globe and know his entire medical history anytime, anywhere.

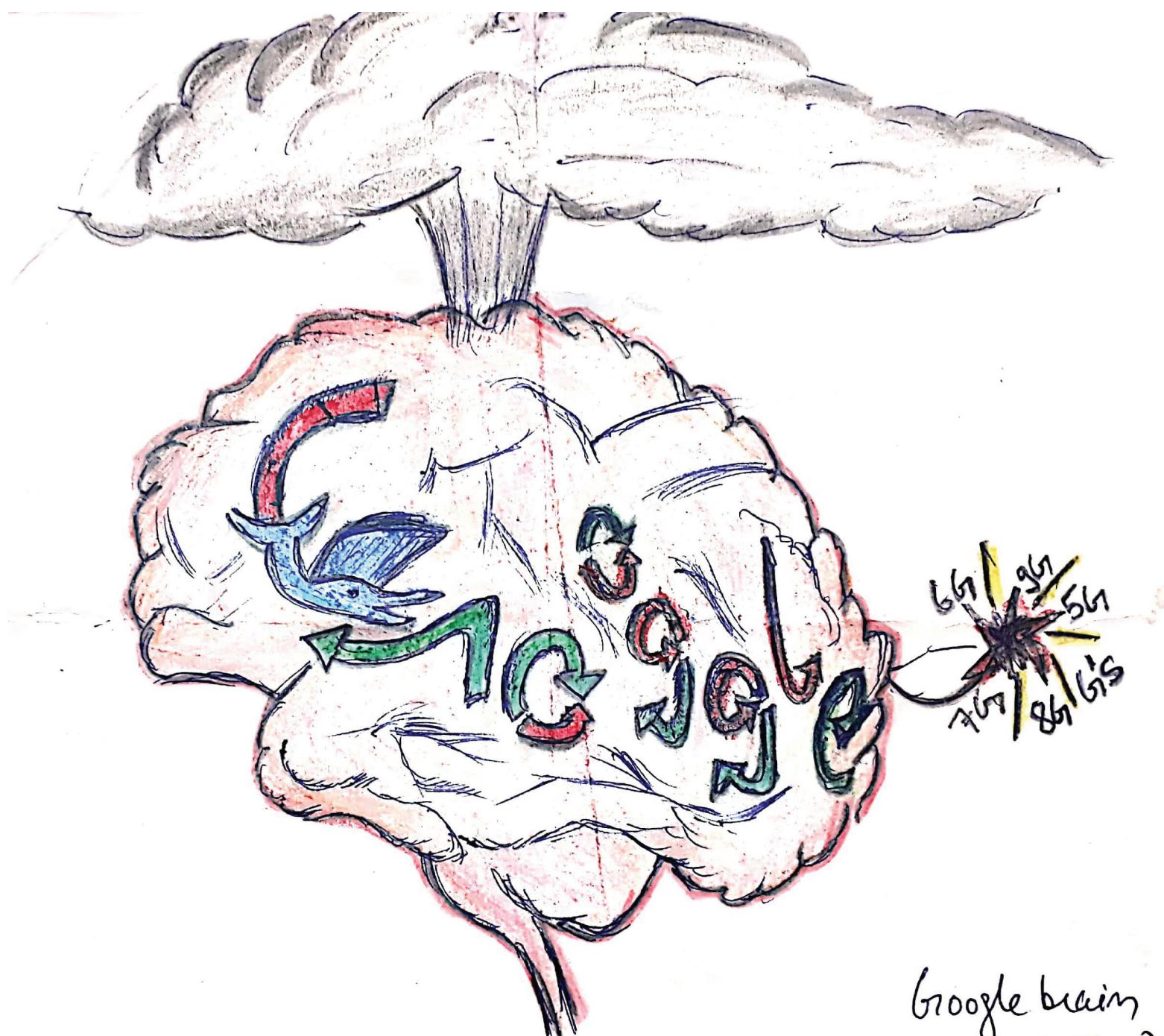
Another simple example of its usage could be transactions across the national boundaries. Since cryptocurrencies have the same value around the world, it helps save a lot of time and in turn money. In the time Banks make the clearances for wiring the money, if the two parties trade in cryptocurrencies, the consignment might even get dispatched till then. And even the commission paid would be comparatively very less.

Considering these innumerable applications, it's obvious that the number of jobs and the pay in this sector are plenty. And due to this being the early age also, in the age of the internet, best of the resources are readily available for free. Massive Online Open Courses (MOOCs) give us the chance to learn from the best professors in the world at almost no cost along with being certified in the technology. Apart from this, initiatives by companies like Hyperledger sponsored by big guns like IBM and Linux Foundation allow us to contribute to developing Open Source Blockchain Frameworks and even building DApps for free.

However, the internet is a place where one gets lost very soon without getting much on what one wants. There are coin offerings by many budding startups in this space. Many people are looking for investors for funding

their next billion dollar Blockchain idea. Many looking to learn, while many just want to stay updated on this technology. These days the sun can't set in any tech-news section media office without having at least an article relating blockchain on their site. However there are attempts by many people to curate all the content in one place. Many Facebook Communities and teams like indiachains.com have been successful in this. However as they say, all it takes is passion and dedication and the rest falls in place by itself!

Happy Blockchaining!!



Doodle Credits to:

ISHITA GOYAL

B.Tech '17/ Electrical Engineering

Google brain  
( SG )



## /TEAM/ PHOTO/

### TORQUE Team L to R:

Arpita Sanjay Kabra, P.Jayakrishna Sahit, Abhinav Singh, Dhyanesh Bhaskaran, Anirudha Soni, Adesh Kushwaha, Rushali Saxena, Deepika Soni, Sourav Mukul Tewari, Abhishek Raghav, Jainish Chauhan, Ishita Goyal, Shruti Katpara.

P.S.: Those who couldn't attend the photoshoot session but are an integral part of the team-  
Karthik Pansetty, Bhavya Gupta, Ekta Khemchandani, Ayush Garg, Vraj Patel.

### ANSWERS TO CROSSWORD:

#### ACROSS

2. E.T.	3. GRAVITY	6. INCEPTION	7. BLADE RUN-
NER	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
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FOR MORE DETAILS





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