

ENVISAGE

2020

Human Networking



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Editor's Note



Dear Reader,

As the year completely filled with thrilling, technical and fun events comes to an end, the editorial team of ISA VESIT proudly presents you with its annual magazine, ENVISAGE'20.

This magazine caters you with technical knowledge of various fields ranging from Radio Astronomy, Quantum Computing and Aircraft GPS Technology. It tries to give you a glimpse of events that ISA-VESIT has conducted during the academic year 2019-20 with some facts in between.

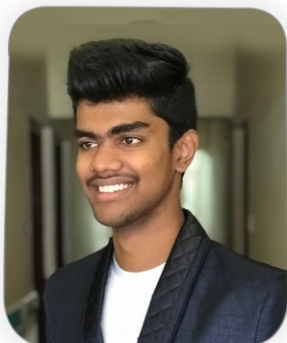
The theme adopted for this year's Magazine, ENVISAGE'20 is 'HUMAN NETWORKING'.

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Chief Editor

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Raj Talashilkar



SE Co-ordinator
Rohit Gwalani

President's Words



My journey with ISA-VESIT has been a roller-coaster ride and the one that I would cherish all my life. I have enjoyed being a part of the council and working on every single assignment, right from day one. From being the co-ordinator in the Second year to being the President in the Final year, one thing that has remained constant throughout, is the dedication towards the council, the feeling that ISA-VESIT should always deliver the best to its student members.

We as a technical society have evolved tremendously over the last couple of years. We have spread our wings and have been conducting enriching workshops under different domains like Web Designing, Data Analytics, Embedded Systems, and Process Instrumentation. We have been on our toes trying to be innovative, offering our members something useful and much of the credit goes to our Senior council that graduated last year. I extend my warm regards to them, for being there for us when we were naive and helping us build character strong enough to lead the society. I would also like to thank Mr. N. Gopalakrishnan and Mrs. Jayassre Ramakrishnan, faculty advisors at ISA-VESIT, for their invaluable guidance, faith in us and for giving us the freedom to be innovative. It would've been impossible to manage all the workshops and other initiatives with such great efficiency without their unwavering support. I express my gratitude towards the administrative and support staff at VESIT without whom many of the events would not have been possible.

ISA-VESIT had just begun with multi-disciplinary workshops when we joined the council in 2017. With a lot of effort and time invested by the council members, ISA-VESIT now not only is proficient under various domains but has also developed its own Mobile App, Web-portal to connect with the alumni, 3D Portal to ease the process of 3D printing, Hardware Library, and Digital Library. There are a lot more facilities that ISA-VESIT is providing to its members and I would like to thank our members for making the best possible use of these facilities. Also, your support and valuable feedbacks are what keep us going, so be in touch with the future councils as well.

I consider myself fortunate as I got the chance to work with the current BE council. I can proudly say that there can not be a better bunch of people to work with. We have been together right from the start and I am glad that we are leaving on a high note. To the TE council, I am proud of you. I believe that I can say this on behalf of the entire BE council that we have full confidence in you guys. We for sure know that ISA-VESIT will keep on flourishing under you. The way the TE council has grown and has shouldered the responsibility over the year is unparalleled. Finally, to the SE council, you are one of the most versatile group of people I have come across. Channelize your energies in the right way and great things will come to you. I wish you all the very best for the future.

I, on behalf of the entire BE council, wish the junior councils, best of luck. ISA-VESIT's future is in safe hands. "Refuse to be average. Let your mind soar as high as it will."

Signing off as President, ISA-VESIT 2019-20,

Mayuresh Shelar
President

Secretary's Words



It has been a miraculous journey at ISA-VESIT in these two years for me. When all of this started, I had never thought that ISA-VESIT would mean so much to me. But now that I have come a long way, it feels as if it's a part of me and resides within me. It all started on 23rd September 2018, when I became SE co-ordinator at ISA-VESIT. This was the year ISA-VESIT started flourishing and spreading its know-how throughout the college. That time I knew I had to take ISA-VESIT at great heights.

ISA-VESIT has given a lot to me. It has taught me to be confident, punctual, friendly and above all, how to love. Love and affection towards each other in the council is what made us feel like family. I learned to believe in myself. It has taught me that nothing is unthinkable and nothing is wasted if you thrive enough to make it come true.

I wasn't technically proficient at the start, but then I started trying, giving in some hard fights, and today I am confident enough to stand in front of a huge crowd and conduct technical sessions.

We at ISA-VESIT believe in spreading knowledge in such a way that it can assist the creation of a better and safe future. Application has always been the main focus in all our workshops and a lot of effort is put in to do so. All of this has helped me and many other students to visualize things in an entirely new and different way.

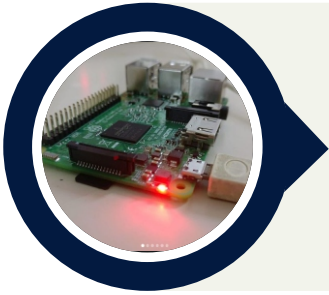
ISA-VESIT has made me discover myself and I want to thank all those who were a part in this spectacular journey of mine.

Prithvi Shetty
Secretary

C O N T E N T

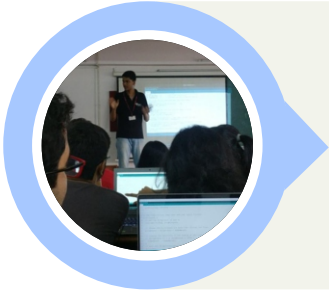
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Events of the year



Raspberry Pi and Python

It marked the beginning of yet another glorious year for ISA-VESIT by being the first workshop of the year 2019-20. It was a fun-oriented technically nourishing workshop, conducted for casting light on the aspects of game development using Raspberry Pi and coding languages like Python.



Arduino Workshop

ISA-VESIT offered a two days Arduino workshop, exclusively for S.E. members, to help them learn the basics of Arduino hardware and software. Students also experienced and gained an understanding of interfacing Arduino with Blynk app.



PLC Workshop

ISA-VESIT conducted a workshop on Programmable Logic Controller for all Process enthusiasts, wherein the students were given valuable insights and detailed knowledge on PLCs.



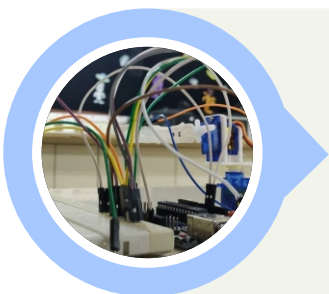
Web Development Workshop

ISA-VESIT conducted a workshop on Web Development with a vision to help members polish their proficiency in the ever-blooming domain of webpage design and development. The theoretical knowledge was put into real-world application by the students, by creating a brand new webpage from scratch.



Bluetooth Communication Workshop

It was a pre-Praxis workshop on Bluetooth Communication with the vision of providing students a glimpse into the world of communication. Students got a basic idea about the working of Bluetooth Controlled Robots, as they were given a practical demonstration about the same.



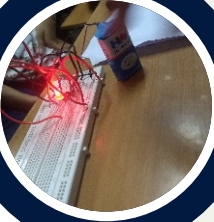
Build and Hit

It was a fun event conducted on 2nd day of Praxis 2019. This game not only tested the aiming skills of the participants, but also their teamwork and diligence. 27 teams competed against each other.



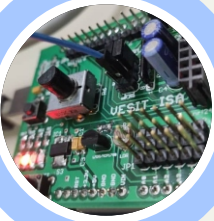
Crack the Code

It was a fun event conducted on 2nd day of Praxis 2019. The event consisted of three rounds. In first two rounds, the participants were given tricky riddles which led them to a location where they had to complete certain tasks. In the final round, participants interfaced an Ultrasonic sensor using Arduino.



Analog Electronics Workshop

To help students get their basics cleared on diodes, transistors, amplifiers and oscillators and to give them hands-on experience of how to select and use components, ISA-VESIT conducted its annual Analog Electronics Workshop.



WSN Workshop

The workshop focused on conveying theoretical along with practical implementation. The workshop began with the introduction to various transmission modes of Arduino like UART, SPI, I2C. Later, the workshop focused on network topologies of NRF and ESP modules with a takeaway kit of ISA-VESIT's customised shield.



FPGA Workshop

A growing field in recent years, FPGA programming is in great demand. ISA-VESIT recognized the need to hold a workshop for it and fulfilled the same. The workshop covered a brief introduction to FPGA, building of simple logic gates, counters and flip-flops using Verilog language in Xilinx ISE.



Embedded Systems Workshop

ISA-VESIT conducted a workshop on Embedded Systems to get students acquainted with the same. Students worked on STM32 IDE wherein HAL instructions were used to program the board. They were also taught how to make repositories on BitBucket.



Be and beyond

It was an interactive session where senior students explained preparation strategies and other aspects pertaining to exams like GRE, TOEFL, CAT and GATE. It also included a detailed explanation of the placement scenario in VESIT.



Image Processing

Through this workshop, students were given insights into various aspects of Image processing and digital object visualization. The participants were taught the technique of applying various algorithms to an image using Numpy, OpenCV and Matplotlib libraries.



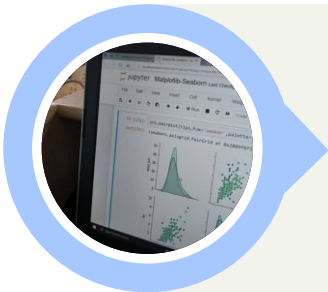
3D printing workshop

ISA-VESIT conducted a workshop for training its members to design and actually print 3D objects right from scratch using its own 3D printer, Flashforge Adventurer 3. It grabbed immense appreciation and proved the technical superiority of ISA-VESIT.



Article Writing Competition

ISA-VESIT conducted its Article Writing Competition with an effort towards facilitating the need for technical comprehensions and effective knowledge sharing. The competition advocated the views of students on various aspects of revolutionary technology.



Data Analytics Workshop

ISA-VESIT conducted its data analytics workshop to teach participants the art of understanding and manipulating a given data set. The content included in this workshop comprised of data cleaning and manipulation, data visualization, predictive analysis and model training using Tensorflow.



App Development Workshop

It was a successful attempt to deliver a session on wonders of easy app development without the tedious process of coding. The attendees were introduced to the backend part of the apps through 'PHP' and 'Javascript' languages. As an end product, a login page was created using Cordova by each team present.



Technovation'20

ISA-VESIT conducted its mega-event Technovation'20 for the students to showcase their prolific creativity and innovative ideas. This annual project making competition was a perfect platform for students to implement all the technical knowledge gained through ISA-VESIT.

“Kuch Creative Corona!”- Featured Artworks



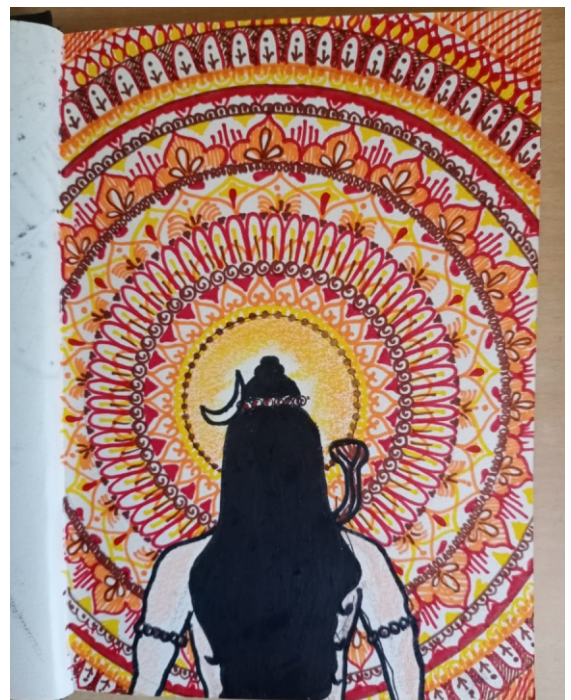
By Raj Talashilkar (D6A)



By Aarya Naik (D9A)



By Mahek Nagdev (D7A)



By Sonali Gaitonde (D18)

The International Society of Automation -Your Connection to Automation

The International Society of Automation is a nonprofit professional association that sets the standard for those who apply engineering and technology to improve the management, safety, and cybersecurity of modern automation and control systems used across industry and critical infrastructure. ISA serves both process manufacturing industries, like chemicals, food and beverage, oil and gas, and pharmaceuticals; and discrete manufacturing industries, like automotive and aerospace.

Founded in 1945, ISA develops widely used global standards; certifies industry professionals; provides education and training; publishes books and technical articles; hosts conferences and exhibits; and provides networking and career development programs for its 40,000 members and 400,000 customers around the world.

ISA's Brand Family



ISA owns Automation.com, a leading online publisher of automation-related content, and is the founding sponsor of The Automation Federation (www.automationfederation.org), an association of non-profit organizations serving as "The Voice of Automation."

Through a wholly owned subsidiary, ISA bridges the gap between standards and their implementation with the ISA Security Compliance Institute (www.isasecure.org) and the ISA Wireless Compliance Institute (www.isa100wci.org).



Learn more about ISA's brand family at brandfamily.isa.org.

How does ISA bring value?

For engineers, technicians, and management engaged in industrial automation, ISA is the trusted provider of standards-based foundational technical resources, driving the advancement of individual careers and the overall profession. ISA brings the right people together to create the technologies of the future and share best practices with the next generation of automation professionals.

ISA's Core Competencies—At a Glance

Standards

ISA is recognized globally for the development of consensus industry standards for automation technologies and applications in key areas such as security, safety, batch control, enterprise integration, wireless communications, traditional instrumentation, measurement, and control; and has produced more than 150 standards documents. 4,000+ automation professionals, on 140 committees have been involved in the development of ISA standards.

Certification

ISA certification provides an objective, third-party assessment and confirmation of a person's skills, and gives them the opportunity to stand out from the crowd and be recognized. ISA currently offers two certification programs: Certified Automation Professional® (CAP®) and Certified Control Systems

Technician® (CCST®). ISA also provides three certificate programs related to the ANSI/ISA84 safety instrumented systems (SIS) standard and five ISA/IEC 62443 Cybersecurity Certificates.

Education and Training

ISA is recognized worldwide as a leader in non-biased, vendor-neutral education and training programs for automation professionals. More than 100 courses are led by practicing industry experts who offer in-depth, real-world coverage of topics critical to automation and control success. ISA offers training in the following diverse formats:

- Instructor-led, classroom courses in several locations in the US and select locations worldwide
- Customized training brought to your location
- Online, instructor-assisted training courses
- Live and recorded webinars
- Online courses
- DVD courses

Publishing

ISA is the authoritative publisher of technical resources covering the automation profession. Written and reviewed by experts, these publications help keep automation professionals fully informed about the latest technical developments, applications, trends, and standards.

Conferences and Exhibits

ISA hosts numerous annual events worldwide that provide quality education, the latest automation developments, and real-world scenarios, with presentations delivered by experts, peers, and industry leaders. ISA's technical Division Symposia include the ISA Analysis Division Symposium, the ISA Food and Pharmaceutical Division Symposium, the ISA International.

Membership

ISA offers individuals the opportunity to join the Society and gain access to dozens of valuable benefits, including discounts on training, conferences, and professional development resources; free viewing of ISA standards; subscriptions to InTech magazine and other technical publications; free online catalog of technical web seminars; and much more. ISA's 140 geographical Sections, located throughout the world, connect members with technology, expert advice, and world-class programming at the local level, while ISA's technical Divisions feature opportunities to network and learn from industry leaders.



Hands-on training using authentic equipment is a signature of ISA technical training

Amazon Web Services and why is it successful?



- Kalpesh Bhole

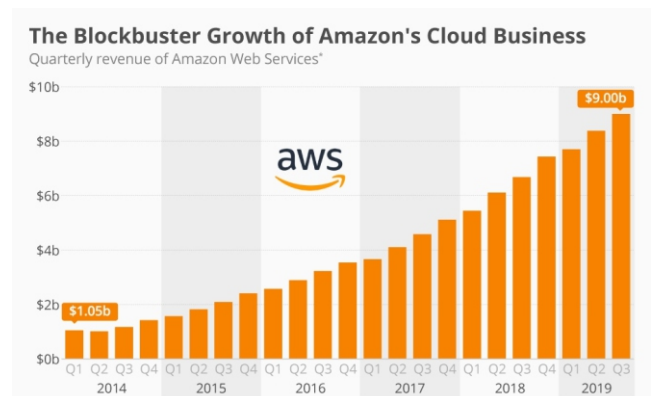
Amazon Web Services (AWS) was a little known, infrequently thought about part of Amazon.com Inc (AMZN) until this year. This year was the first time in the division's nine year history that Amazon revealed its revenue figures and the numbers were ever shocking. In the first quarter of 2015, AWS brought in over \$1.5 billion of revenue, a figure which grew to \$1.8 billion the following quarter and to \$2 billion in the third quarter. Amazon today reported earnings for its third fiscal quarter of 2019, including revenue of \$70.0 billion, net income of \$2.1 billion, and earnings per share of \$4.23 (compared to revenue of \$56.6 billion, net income of \$2.9 billion, and earnings per share of \$5.75 in Q3 2018)..What is AWS and why is it so lucrative and successful for Amazon?



AWS is made up of so many different cloud computing products and services. The highly profitable Amazon division provides servers, storage, networking, remote computing, email, mobile development and security. AWS can be broken into two main products: EC2, Amazon's virtual machine service and S3, Amazon's storage system. AWS is so large and present in the computing world that it's now at least 10 times the size of its nearest competitor and hosts popular websites like Netflix Inc (NFLX) and Instagram (Subsidiary of Facebook Inc.: FB). AWS is divided into 12 global regions, each of which has multiple availability zones in which its servers are located. These

serviced regions are not only divided in order to allow users to set geographical limits on their services (if they so choose), but also to provide security by diversifying the physical locations in which data is held.

"AWS has grown an average of 48% over the three years ending December, 2018, booking nearly \$26 billion in sales that year."



Cost Savings

Jeff Bezos has likened AWS to the utility companies of the early 1900s. One hundred years ago, a factory needing electricity would build its own power plant. But once the factories were able to buy electricity from a public utility, the need for pricey private electric plants subsided. AWS is trying to move companies away from physical computing technology and onto the cloud. Traditionally, companies looking for large amounts of storage would need to physically build a storage space and maintain it. Storing on a cloud could mean signing a pricey contract for a large amount of storage space that the company could "grow into". Building or buying too little storage could be disastrous if business took off and expensive if it didn't. The same applies to computing power. Companies which experience surging traffic would traditionally end up buying loads of power to sustain its business during peak times. On

times—May for tax accountants for example—computing power lays unused, but still costing the firm money. With AWS, companies pay for what they use. There's no upfront cost for building a storage system and no need to estimate usage. AWS customers use what they need and their costs are scaled automatically and accordingly.

Scalable and Adaptable

Since AWS's cost is modified based on the customers' usage, start-ups and small businesses can see the obvious benefits of using Amazon for their computing needs. In fact, AWS is great for building a business from the bottom as it provides all the tools necessary for companies to start up with the cloud. For existing companies, Amazon provides low-cost migration services so that your existing infrastructure can be seamlessly moved over to AWS. As a company grows, AWS provides resources to aid in expansion and as the business model allows for flexible usage, customers will never need to spend time thinking about whether or not they need to reexamine their computing usage. In fact, aside from budgetary reasons, companies could realistically "set and forget" all their computing needs.

Security and Reliability

Arguably, AWS is much more secure than a company hosting its own website or storage. AWS currently has dozens of data centers across the globe which are continuously monitored and strictly maintained. The diversification of the data centers ensures that a disaster striking one region doesn't cause a permanent data loss worldwide. Imagine if Netflix were to have

all of their personnel files, their content and their backed-up data centralized on-site on the eve of a hurricane. It would be madness. In fact, even failing a natural disaster, localizing data in an easily identifiable location where hundreds of people can realistically obtain access is unwise. AWS has tried to keep their data centers as hidden as possible, locating them in out-of-the-way locations and allowing access only on an essential basis. The data centers and all the data contained therein are safe from intrusions and, with Amazon's experience in cloud services, outages and potential attacks can be quickly identified and easily remedied, 24 hours a day. The same can't be said for a small company whose computing is handled by a single IT guy working out of a large office.

The Bottom Line

AWS is a cash cow for Amazon. The services are shaking up the computing world in the same way that Amazon is changing America's retail space. By pricing its cloud products extremely cheaply, Amazon can provide affordable and scalable services to everyone from the newest start-up to a Fortune 500 company.

KEY TAKEAWAYS

- Amazon is one of the world's most valuable companies, but it does not actually make a majority of its income from selling books and other items.
- Amazon's main profit driver is Amazon Web Services, or AWS - the company's cloud computing and web hosting business.
- Amazon controlled more than a third of the cloud market in 2018, more than twice its next closest competitor.



Where is everyone?

Explaining the reason for silence in our Universe



- Pranav Bindra

Are we the only living thing in the universe? The observable universe is about 90 billion light years in diameter. The numbers get mind boggling from here. There are at least 100 billion galaxies, each with 100-1000 billion stars. There are probably trillions and trillions of habitable planets in the universe, which means there should be a lot of opportunity for life to develop right? But where is it?



There are at least 10 billion Earth-like planets in the Milky Way itself, and many of them have been around way before the Earth, yet we observe no galactic civilizations. We should be able to see something, but space seems to be empty and dead. This means something is preventing living things from becoming a galactic wide civilization, something that makes the foundation of such a civilization very hard and maybe impossible. This is called the “**Great Filter**”. There are 2 scenarios. One that we are incredibly special and lucky, the other means that we are doomed. It depends whether the filter is behind us or ahead of us. If the filter is behind us that means one of the steps we passed is impossible to take. It can be the formation of complex animal cells, extinction of dinosaurs or the formation of “intelligence” in modern humans. It took us roughly 200,000 years to go from sharp sticks to where we are now, so intelligent life may be very rare. If the filter is ahead of us that means there is a roadblock ahead of us which is so dangerous that all species that have encountered it have failed

A large scale nuclear war, nanotechnology that gets out of control, a super intelligent AI that accidentally or purposely destroys its creators.

The **Fermi Paradox** is the apparent contradiction between the lack of evidence for extraterrestrial civilizations and various high estimates for their probability. There are many hypotheses for this paradox:-

Water world Hypothesis:- Other water bearing planets have much less land mass compared to Earth. We know that all life on our planet existed in water and it was because of the formation of land that we ventured out to different terrains. 32 percent continental mass may be too high among water worlds.

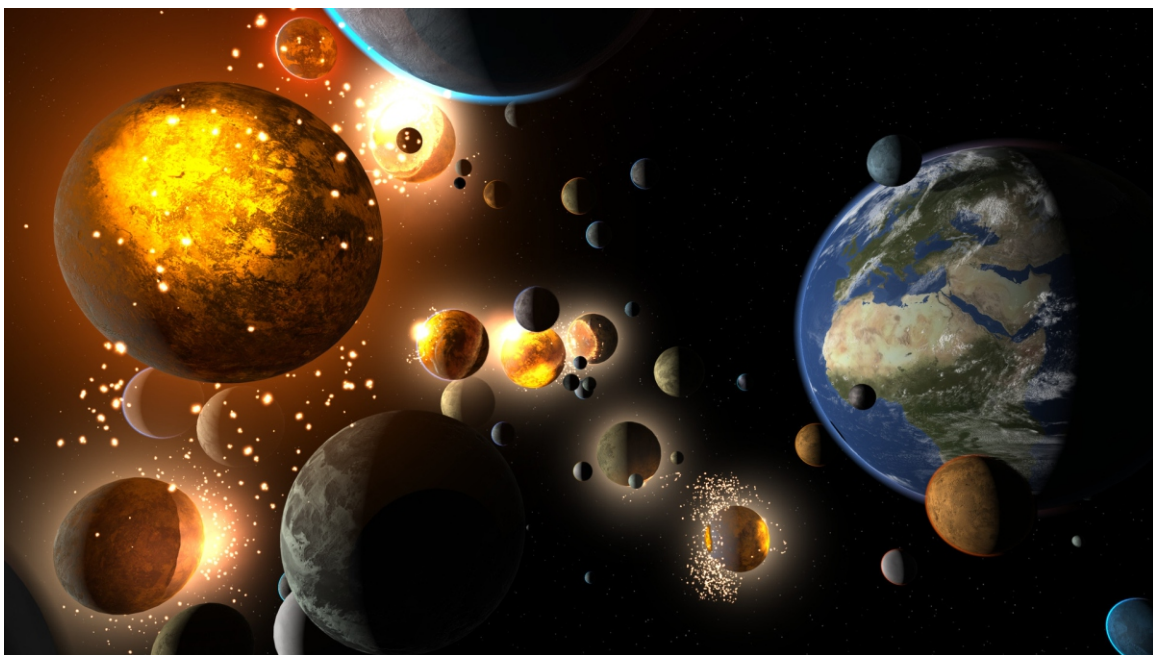
Intelligent civilizations are too far apart:- It may be a possibility that we are too far apart for meaningful 2 way communication. If 2 civilizations are separated by thousands of light years, it is possible that one or both cultures may become extinct before meaningful dialogue can be established.



Humans have not existed long enough:- Our ability to detect extraterrestrial life has existed for only a very brief period- from 1937. To put that into context if we consider that the universe was formed an year ago, humans came into existence just 12 minutes ago, and intelligent human life about 200 seconds ago.

Earth is deliberately not contacted:- Intelligent extraterrestrial life exists and does not contact Earth to allow for its natural evolution and development. Another variation of this is that we are in a simulation. It is not beyond the realms of possibility for

an advanced civilization to simulate all of humanity. And we as humans have always believed in a power above us. Wait, are they Gods? There are many theories, hypotheses and scenarios but the best we can hope for is that intelligent life is very rare and we are the first ones to reach here. One thing we need to acknowledge is that we don't know anything. We have spent more than 90 percent of our existence as hunters, 5000 years ago we thought we were the centre of the universe, 200 years ago we stopped using human labour as the main source of energy and 30 years ago we had apocalyptic weapons pointed at each other due to a political disagreement. Humans have come far, but there is still a long way to go.



How Bots will completely kill Websites and Mobile Applications



- Jatin Dandelia

I know... you're reading this article because you think the title is ridiculous. Bots will never become more popular than websites and mobile apps. How could they? Right? **WRONG!**

Not only do I believe that bots will dethrone websites and mobile apps, I actually believe that bots may replace websites and mobile apps altogether.

“But Jatin, most people don’t even know what bots are! What are you talking about?! You are crazy.”

Maybe... but guess what? By the time you finish reading this article, I guarantee that you will agree with me. Then we can be crazy together. Here are the three logical reasons why I believe that bots will completely replace websites and mobile apps. Ready? Let's do this.

1. Every Business Is Going to Have a Bot.

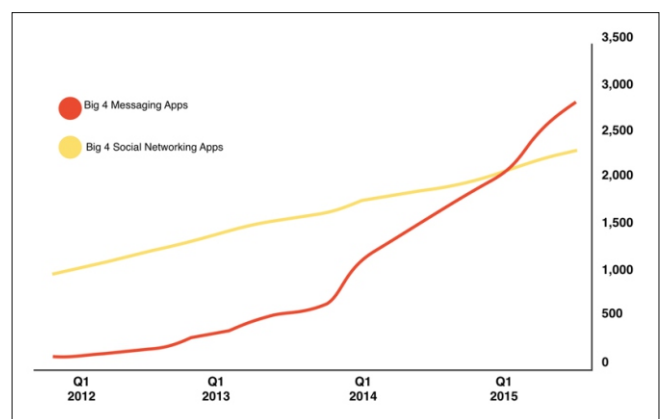
You may not know this, but messaging apps are growing fast. Like, ridiculously fast. Facebook Messenger for example is used by over 1 billion people every month and it is growing faster than Facebook. That is insane. If messaging apps become the #1 way people communicate, then every business is going to need a way to engage on these platforms.

“Ok, that makes sense... but how does a business talk to people on messaging apps?”

Great question! There are two ways businesses can talk to people on messaging apps.

- The business sets up something similar to a call centre where real people are chatting online all day long. This isn't cost effective and 99% of businesses can never do this.
- The business uses a computer to talk to everyone. The computer can respond instantly, can communicate with any number of people simultaneously, and it's incredibly cost effective. These computers are called bots.

If messaging apps become the #1 way people communicate, and every business needs a strategy to engage with people on messaging apps, and bots are the only scalable way to do this, then every business will eventually have a bot.



“Ok, ok, sure. Every business will have a bot. But why would I ever use their bot instead of their website or mobile app?”

This is where things get even more interesting. Let me explain.

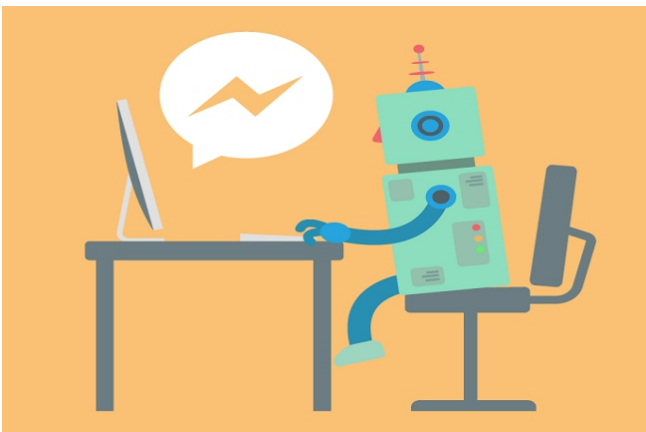
2. Bots Will Be Faster Than Websites and Mobile Apps.

Bots aren't that smart yet. They don't understand everything you are saying, they can't teach themselves, and to be honest right now bots are more similar to lightweight apps than artificially intelligent personalities. But one day we'll get there. Imagine a world where the experience of talking to a business via a bot is at least just as good as using its website or mobile app. I believe that in this situation people will choose to talk to the bot rather than go to the website or use the mobile app.

“Uhhh... no Jatin. People won't want to use the bot.”

I understand your scepticism! But I disagree. Here's why I think people will choose to talk to the bot:

- It can take seconds, or even up to a minute, to load a website. Bots load instantly. As long as two products are comparable in value, people will always use the one that loads fastest. In this case, that would be the bot.
- Mobile apps need to be downloaded. They take up valuable real estate on your phone and they take time to download. Bots don't need to be downloaded. You just send them a message and you're using it.



“Jatin, do you really think everyone will use bots just because they load fast and you don't have to download them?”

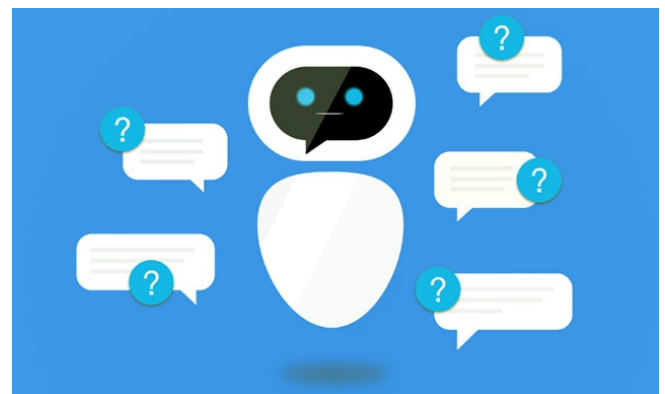
No, there's another reason, and it's the most important one. Ready?

3. Bots Will Be Easier to Use Than Any Other Technology Ever Created.

Every website and mobile app is designed with a visual interface. Buttons, text, images, and so on. And guess what? Not every website and mobile app is designed the same. This means that you constantly have to learn new visual interfaces in order to use your favourite products. Not ideal. Now, take a second to think about “language” as if it was a different type of interface. Language as an interface is something everyone is taught the moment we are born. Our parents, and others, teach us how to talk, and that's how we learn to interact with the world around us.

“Makes sense Jatin, but where are you going with this?”

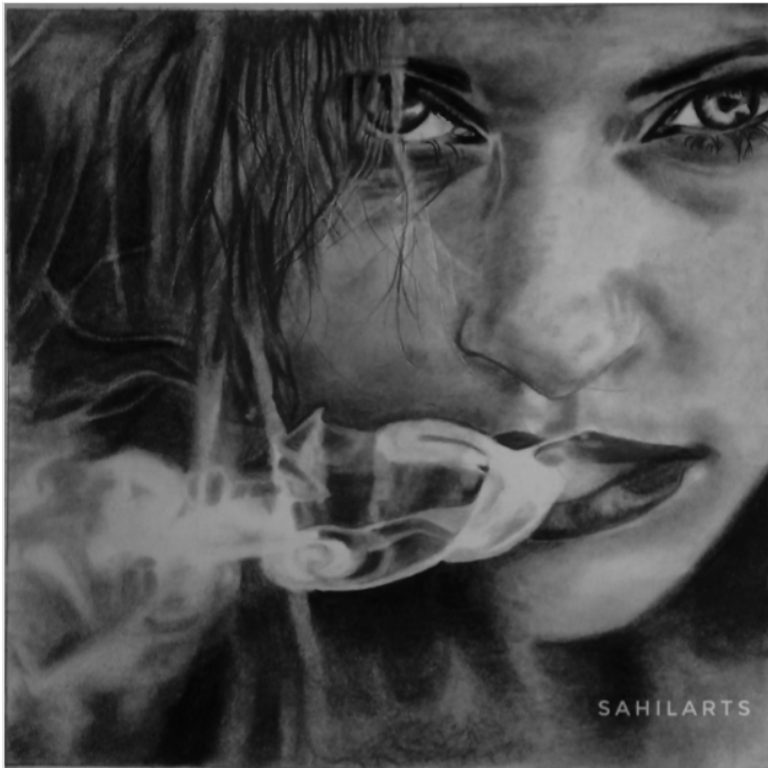
Language is the most natural interface humans understand, and that's the interface that bots use. Instead of needing to constantly learn visual interfaces, bots will enable us to naturally use language, the first interface we were ever taught. In the future, maybe 5 or 10 years from now, bots will be able to understand you completely. Not like Siri, or anything else you've ever used, I mean they will absolutely completely understand what you are saying. Not like a person, but infinitely better. Think about this.



If you were going to plan a trip today you would go to a travel website. You would browse, find hotels, figure out which ones are in the right area, where the restaurants are, etc. You would have to mentally keep track of everything while figuring out what you want to do. Now imagine that instead of scrolling through the website yourself, you could actually talk to the travel website via a bot, and it would understand everything you say perfectly. This is going to be one of the biggest shifts in how people interact with computers. In the future, talking to a bot will be like talking to a real person who has instant access to entire databases of information and can process your thoughts and desires instantly. This is where the world is going.

This is why I believe that it's very likely that bots will completely kill websites and mobile apps.

“Kuch Creative Corona!”- Featured Artworks



By Sahil Kedari (D13)



By Hrutika Pakhale (D3)



By Sakshi Suryawanshi (D11B)



By Tejas Dhopavkar (D7A)



Arduino Boards



ARDUINO UNO WITH LOGO



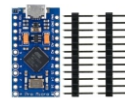
ARDUINO MEGA WITH LOGO



ARDUINO NANO WITH WELDING



ARDUINO PRO MINI



ARDUINO PRO MICRO



ARDUINO LEONARDO



ARDUINO DUE



ARDUINO MEGA ADK



RASPBERRY PI Boards



RASPBERRY PI ZERO



RASPBERRY PI 3 MODEL B+



RASPBERRY PI CABINET



RASPBERRY PI CAMERA



GSM & GPS Boards



SIM 800



SIM900A



SIM300



GPS SIM28

SERVO MOTOR



SG-90G MICRO SERVO MOTOR (PLASTIC GEARS)



MG-90S MICRO SERVO MOTOR (METAL GEARS)



MG-995 METAL SERVO GEAR MOTOR



MG-996R METAL SERVO GEAR MOTOR



S-3003 SERVO MOTOR

SENSOR & SENSOR MODULE



MQ-2 SENSOR



MQ-2 MODULE



MQ-3 SENSOR



MQ-3 MODULE



MQ-4 SENSOR



5V-1 RELAY MODULE



5V-2 RELAY MODULE

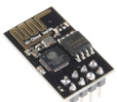


5V-4 RELAY MODULE

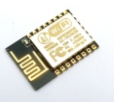


5V-8 RELAY MODULE

IOT (INTERNET OF THINGS)



ESP8266-01



ESP8266-12E



ESP8266-07



NRF24L01



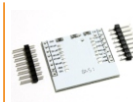
NRF24L01 MINI



NRF24L01 WITH ANTENNA



NRF ADAPTOR



ESP BREAKOUT BOARD



NODEMCU CP2102 CHIP



WEMOS D1 MINI



WEMOS D1



HC-05 BLUETOOTH MODULE (6 PIN SLAVE WITHH BUTTON)



HC-06 BLUETOOTH MODULE (4 PIN SLAVE)



HM-10 BLUETOOTH MODULE (6 PIN SLAVE)



XS3868 BLUETOOTH STEREO AUDIO MODULE



PCA9685 16 CHANNEL 12-BIT PWM SERVO MOTOR DRIVER



SERVO TESTER



MACNET TECHNOLOGY

The Total ROBOTICS Solution

18, Shree Ganesh Bhuvan (Kalpana Bldg.), 1st Floor, 357 - Lamington Road,
Opp. Police Station, Grant Road (East), Mumbai - 400 007 (INDIA).

SENSOR MODULE

| | | | | | | | | |
|---|---|---|--|---|---|---|---|---|
|  |  |  |  |  |  |  |  |  |
| L298N BOARD | L293D SHIELD | L298N SHIELD | PWM-3AMP MOTOR SPEED CONTROLLER | PWM-10AMP MOTOR SPEED CONTROLLER | L9110S MOTOR DRIVER | R305 FINGER PRINT MODULE | RF ID CARD READER MODULE | Rc522 RFID MODULE |
|  |  |  |  |  |  |  |  | |
| DHT-11 SENSOR MODULE | DHT-22 SENSOR MODULE | 0.96 INCH OLED DISPLAY | 16*2 + I2C MODULE | Tm1637 LED DISPLAY MODULE 4 DIGIT 0.56" | DS3231 RTC MODULE | DS1307 RTC MODULE | SOIL MOISTURE SENSOR MODULE | |
|  |  |  |  |  |  |  |  | |
| RAIN DROP SENSOR MODULE | WATER SENSOR MODULE | PROXIMITY SENSOR | ACS 712-5AMP | HC-SR-04 ULTRASONIC SENSOR MODULE | TECL-12706 Thermoelectric Cooler Peltier Plate | ADX1-335 MODULE | MPU-6050 MODULE | |
|  |  |  |  |  |  |  |  | |
| WATER FLOW SENSOR (YF-S201) | HC-SR501 HUMAN INFRARED/ MOTION/PIR MODULE | IR SENSOR MODULE | TP-223 TOUCH SENSOR MODULE | TILT SENSOR MODULE | LDR SENSOR MODULE | SOUND SENSOR MODULE | FLAME SENSOR MODULE | |
|  |  |  |  |  |  | | | |
| TCS3200 COLOUR SENSOR MODULE | Cp2102 MODULE | PI2303 MODULE | DTMF MODULE | MT3068 MODULE | ENCODER ROTATRY SWITCH MODULE | | | |
|  |  |  |  |  |  |  | | |
| L293D BOARD | CAMERA MODULE (Ov7670) | SD CARD MODULE | MCP2515 CAN Bus Module TJA1050 Receiver SPI Module (Blue) | AD 8232 HEAR RATE MONITOR | Hx711 MODULE | Hx711 MODULE & LOAD CELL KIT | | |
|  |  |  |  |  |  | | | |
| Tb6560 stepper motor driver | Tp4056 1A 3.7V Lipo Battery Charging Board | Tp4056 Lithium Battery Charger Module With Protection | Lipo Battery Low Voltage Tester Checker | BMP180 SENSOR | BMP280 SENSOR | | | |
|  |  |  |  |  |  |  | | |
| CNC SHIELD | SIM 800L MODULE | HMC5883 BOARD | MAX30100 MODULE | FTDI MODULE | A4988 BOARD | RAMPS 1.4 | | |

18, Shree Ganesh Bhuvan, 1st Floor, 357-Lamington Road,
Opp. Police Station, Grant Road (East), Mumbai-400 007 (India).

“Kuch Creative Corona!”- Featured Artworks



By Mahek Nagdev (D7A)



By Rashmi Singh (D8)



By Harsh Suvarna (D13)



By Mrunali Kolte (D18)

Should Personal Data of individuals be treated as a “National Asset”?



- Adith Nair

This dilemma was created by the government in the new draft of the national e-commerce policy on 23 February 2019 which forwards key points of the data protection bill which is not only unconstitutional but also immoral and indecent.



‘Data is the new oil’. However, cliché it sounds but this is the exact analogy that the government is using while drafting the new ecommerce policy. While some companies like Rediff.com agree with this analogy, data cannot be compared to oil on the basis of the following reasons:

- 1) Non-Exclusive: the basic difference between data and oil is that data is easily replicable and it can be shared across multiple recipients which makes it non-exclusive.
- 2) Non-Exhaustive: there is an endless source of data unlike any other minerals.
- 3) Intangible: data is not geo specific unlike oil and hence its intangible
- 4) Value: data has no intrinsic value of its own and it depends upon the processing of the data.

Since we have established that the entire analogy is false, we have proved that the policy is not practical but that's not all.

The draft starts by saying that the individual owns their own data however it then posits the individual's data as a national asset and suggests the state to have ownership over it. The state acts as a fiduciary of the data which is itself a violation of the fundamental rights of Indians.

Taking into consideration the supreme court judgment on Aadhar as they struck down section 57 of the act that allowed personal usage of biometric data stored in the Aadhar database for verification by private entities. The supreme court stated that Aadhar which has the largest collection of data held by a state entity cannot be shared with any private entities. As per the precedent set by the Aadhar case, the draft policy of the bill seems to be unconstitutional and reckless.



India's digital economy is supposed to reach a \$1tn valuation by 2022. By treating data as a national asset we are following in the footsteps of Chinese government who have the same policies. Although it may have worked wonders for some Chinese companies, at the same time it became difficult for foreign companies to grow in China. Even companies like Facebook, Google, IBM have approached the government saying that the restrictions caused will hurt India's digital market by stifling innovation, hurting consumer choice and capital flow.

Even the US-India Strategic Partnership Forum (USISPF) which represents several major companies have submitted their suggestion to the government regarding using personal data as a national asset. They quote - "If data is to be classified as a national asset, obtaining the content of the individual to access the data will no longer be necessary. The draft policy is, to that extent, advocating non-consensual transfer of data, which is inconsistent with the judicial classification of data as an aspect of informational privacy, which is a fundamental right."

As per a survey on local circles, more than 50% startups feel that access to personal data should not be shared since there are some serious loopholes in the policy like it ignores the international principles of intermediary liability.

Concluding this article, we feel that treating personal data as a national asset is not something that can be done unless we have strong laws and policies protecting it. As Anna Eshoo has rightly pinpointed "When we share our personal data with business, its use should be transparent and secure."



The Art of Engineering



- Prajwal More

According to Wikipedia, art is defined as “a diverse range of human activities in creating visual, auditory or performing artifacts (artworks), expressing the author's imaginative, conceptual ideas, or technical skill, intended to be appreciated for their beauty or emotional power.” I am a final year engineering student and over the past few years, I have realized that this definition holds true for engineering as well when you look at it through an engineer's perspective. You don't necessarily need a musical instrument or a paintbrush to create art. I love photography and it does not mean just clicking



pictures and uploading it on your Instagram. Photography involves understanding of lighting, colour science, camera angles and whatnot. When you click a picture using a digital camera a lot of things happen within the camera which we call Image Processing. Being an engineer I was able to study Image Processing as a part of my curriculum and this made me understand the tools and software that I use to create images in more depth. I was able to understand how light and colours

work with a wider perspective. Now the software that is used to edit images is developed by engineers. These are nothing but lines of code compiled together to form software and for me, that is a piece of artwork. Now one might say that it is just a tool used to create art. I'll give another example to make my point more understandable. Recently, we witnessed the first digital image of a black hole which was not captured using an optical telescope instead, an array of separate radio telescopes was used to collect radio frequencies of objects surrounding the black hole and a silhouette was formed. This silhouette indicated the absence of light which is absorbed by the black hole. A number of computer algorithms were used to compute and synchronize data from different radio telescopes which are again nothing but lines and lines of code. The beautiful image obtained as a result of many scientists and engineers working together is a masterpiece. So art can also be created from a piece of code and is not limited to what tools one may use.



The technology used for imaging black hole is not new and is being used for decades to image celestial bodies and satellites sent far away from earth. We all are very much familiar with video games unless you are someone who eludes from technology. And similar to creating digital images, video games involve creating motion by generating multiple images every second. This is the by-product of image processing and

computer vision. Designing ergonomic and aesthetic looking products, making futuristic smartphones and gadgets is possible by broadening the horizon of creativity. Audio/Sound engineers have moved away from a scientific and analytical approach of sound design to one that is more akin to a subjective creative process. The debate that art, especially music, should be only created by traditional means and tools still exists but people have started to accept the electronic, non-traditional methods and are fine with electronic music. We have seen marvels in terms of civil, mechanical and industrial engineering terms from building huge skyscrapers to the fastest car in the world.

It's true that art is subjective and each individual perceives it in a different way. That being said one should not limit their horizon of creativity just because someone else does not find it

to be creative enough. Whenever I take up any technical projects I try to keep a creative approach towards it and that makes it a fun full experience. Also, it helps in the learning process as you try to explore more and more of it. We all start with blink LED or hello world program to get started with. The same program can be tweaked to form different patterns or change sequence of blinking of multiple LEDs. Maybe you can create a paint software of your own or create your own synth-wave music. There are endless options to what you can do as an engineer and sky is the limit for your creativity because ultimately art is “a diverse range of human activities in creating visual, auditory or performing artifacts (artworks), expressing the author's imaginative, conceptual ideas, or technical skill, intended to be appreciated for their beauty or emotional power” and you can do the same through engineering. And if that is not art then I don't know what is. :)



Quantum Computing



- Raj Talashilkar

Quantum computers could spur the development of new breakthroughs in science, medications to save lives, machine learning methods to diagnose illnesses sooner, materials to make more efficient devices and structures, financial strategies to live well in retirement, and algorithms to quickly direct resources such as ambulances.



The main part of quantum computing is a qubit which is the fundamental unit of quantum information. Rather than being '1' or '0' bit, qubit is a superposition of one and zero and thus can be used to store more data, but it is difficult to keep the qubit unaffected by surrounding environment. Any external stimulus collapses the superposition. For a system like cryptography structure where information security is a priority this qubit property is used and can be easily told if the information was tapped while transfer. There are a few different ways to create a qubit. One method uses superconductivity to create and maintain a quantum state. To work with these superconducting qubits for extended periods of time, they must be kept very cold. Any heat in the system can introduce error, which is why quantum computers operate at temperatures close to absolute zero, colder than the vacuum of space.

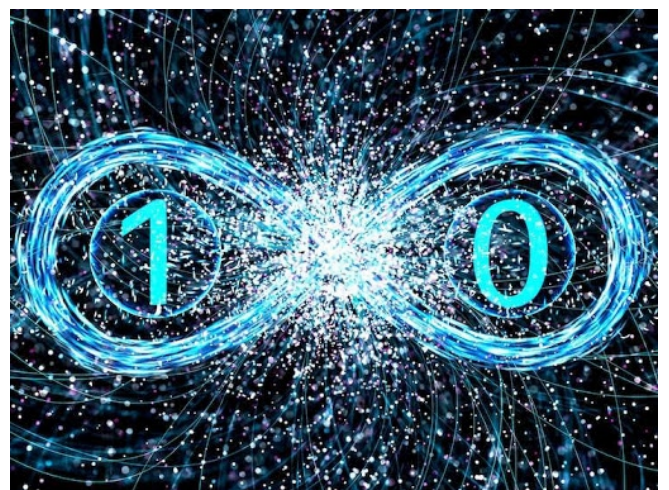
Quantum computing supremacy:

For the time being, classical technology can manage any task thrown at a quantum computer. Quantum supremacy describes the ability of a quantum computer to outperform their classical counterparts.

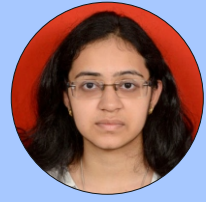
Some companies, such as IBM and Google, claim we might be close, as they continue to cram more qubits together and build more accurate devices.

Google says that its 54-qubit Sycamore processor was able to perform a calculation in 200 seconds that would have taken the world's most powerful supercomputer 10,000 years. That would mean the calculation, which involved generating random numbers, is essentially impossible on a traditional, non-quantum computer.

Just like every other invention, quantum computing has its own problems. Many mathematicians think that this is just another obstacle and will take many years. Only time will tell.



Radio Astronomy



- Rashmi Singh

When you gaze up at the night sky you see light given off by stars. That light has traveled across space for dozens, hundreds or thousands of years before entering your eye. When astronomers use large telescopes to probe the Universe, the faint light they gather may have come from objects millions or billions of light-years away. In effect, we see objects as they were in the past as it takes that light time to travel across space. Astronomy, perhaps the oldest of Sciences, is the study of celestial objects including the planets, stars, galaxies - even the Universe as a whole. What then is radio astronomy?



Radio astronomy is a fascinating area of technical endeavor and is open to even people with very few engineering skills. It does not require vast expenditure, as most of the equipment can either be home-constructed or obtained from amateur radio outlets. Some attention to detail is required and patience is needed to assemble a perfect receiver system to enable the detection of very weak signals with stable gains and a constant

low noise background. Radio astronomy is much like optical astronomy, in that telescopes (instruments that detect, image and magnify) are used to observe the cosmos. The difference is that while optical telescopes present images that are familiar in composition (i.e. they present images at frequencies which we can directly see), radio telescopes observe the cosmos at much lower frequencies.

To put it simply, each colour has a different frequency, and most of the colour pallet with which the cosmos is painted is invisible to our eyes. It only makes sense to expand our sensitivity, through instrumentation, to the other frequencies in the electromagnetic spectrum. The radio telescope is one of these instruments. It allows us to observe and image the universe at frequencies below our visual abilities which in turn reveals much of what is going on in the universe. Because certain radio frequencies pass effortlessly through pesky dust and gas clouds, we can now study objects heretofore blocked from our view. Also, since certain gases, molecules, and materials in the universe either absorb or emit 'light' at radio frequencies, these structures can be directly viewed by the radio telescope. This ability not only allows the observer to image these objects but also allows the observer to gather much more information such as composition, velocity, temperature and mass.

With the advent of DSP (Digital Signal Processing), faster and smaller computers, and the introduction of super conducting amplifiers, radio astronomy has progressed at a breakneck pace. New arrays of antennas are being designed and built. Some contain over a thousand individual antennas all operating in harmony, giving resolutions that rival optical telescopes. Other arrays cover a hectare, and one in process covers a square kilometer as a "phased array", giving imaging capabilities not experienced before. The future for radio astronomy looks brighter than ever.

Aircraft GPS Tracking



- Deepesh Shahdadpuri

GPS aircraft tracking is a means of tracking the position of an aircraft fitted with a GPS receiver. By communication with GPS satellites, detailed real-time data on flight variables can be passed to a server on the ground. This server stores the flight data, which can then be transmitted via telecommunications networks to organizations wishing to interpret it. The different kinds of telecommunication networks used are:

- ACARS which is a hybrid of the VHF, satellite and HF network.
- The transponder "Mode S" (ADS-B) network.
- Satellite networks (Global star, Inmarsat, IRIDIUM, Thuraya).
- The GSM network.

Equipment

Some devices are avionics components like ACARS and ADS-B. In these cases, the receiving and transmitting antenna are

usually located outside of the airframe. When devices are not installed as avionics components, they have to be completely independent from the aircraft. They are typically placed inside of the airframe in a location where the GPS and communication satellites are directly visible to the device, for example through the cockpit window. The output signal must also be able to penetrate the aircraft - most civil aviation authorities require compliance with DO-160 for audio frequency conducted susceptibility and induced signal susceptibility. Authorities classify non-installed components as "transmitting portable electronic devices" (T-PEDS) and as such require them to be switched off during the critical phases of flight.



Active aircraft tracking

There are several active aircraft tracking systems available on the market that use the "bread-crumbs" approach to SAR. Rather than relying on an emergency locator transmitter to transmit upon impact, the next generation of emergency locating devices are active tracking devices that send position reports at regular time intervals. If the unit stops transmitting upon impact, the historical transmissions will give the last known location of the aircraft, its speed, direction and altitude. Tracking as an alternative or complement to current technology has recently been encouraged by the Coroner in New Zealand.



Future Use of GPS

GPS enhances everyday civil life, for GPS receivers enable and improve aviation, search and rescue, surveying and mapping, trucking and shipping, fishing, tracking, space exploration, offshore drilling, and also have many scientific uses. GPS has been used in planes, cars, trains, boats, watches and cell phones, as well as for improving productivity and efficiency in many areas. GPS also furthers scientific aims, such as weather forecasting, earthquake prediction, and environmental protection. Furthermore, the precise GPS time signal, derived from atomic clocks, is embedded in critical economic activities such as synchronising communication networks, managing power grids, and authenticating electronic transactions. GNSS is the standard generic term for global satellite navigation systems that provide global GPS coverage. As of today, GNSS receivers have been used in drones, IOT products, sensors, intelligent transport systems and GPS tracking systems, and half of all current GPS receivers

in use can receive signals from two or more GNSS systems. Seven billion GPS receivers are being used in all sorts of vehicles and devices in 2017, and it is supposed to reach ten billion by 2023.

Applications

- Accurate real-time data provided by GPS aircraft tracking may be offered to air traffic control using ADS-B technology.
- This can safely reduce airspace separation of aircraft. GPS aircraft tracking also enables airlines to track their fleet of aircraft over the ACARS system, and allows aircraft to be more easily located in the event of an accident.
- The data is processed to gather "OOOI" information about movements within the airport and to compute flight time.
- Finally, GPS aircraft tracking permits a flight school to track a trainee pilot and debrief his/her flight path afterwards.

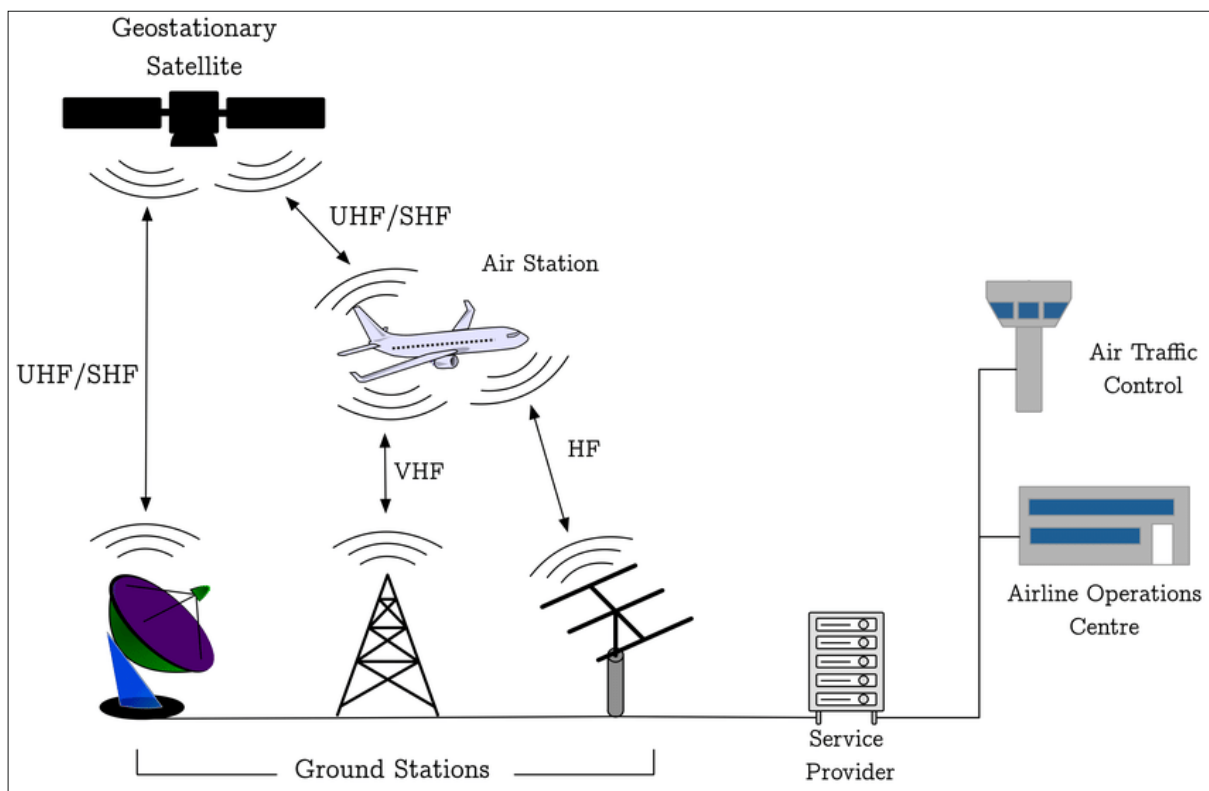


Image Processing and Machine Learning in Biomedical Field



- Sonali Gaitonde

This article is written mainly to explain how Engineering techniques can bring about revolutionary changes in the medical field. These two fields in tandem with each other can change the diagnostic process, eliminating the amount of time required to reach a particular diagnosis as well as avoid variations in the opinions of the doctors. However, it needs to be made clear that these techniques in no way can replace a doctor, these techniques can only assist the doctors and the technicians. We will move forward taking into consideration how 'Image Processing' and 'Machine Learning' can be used in the detection of 'Diabetic Retinopathy' in 'Fundus Images'.

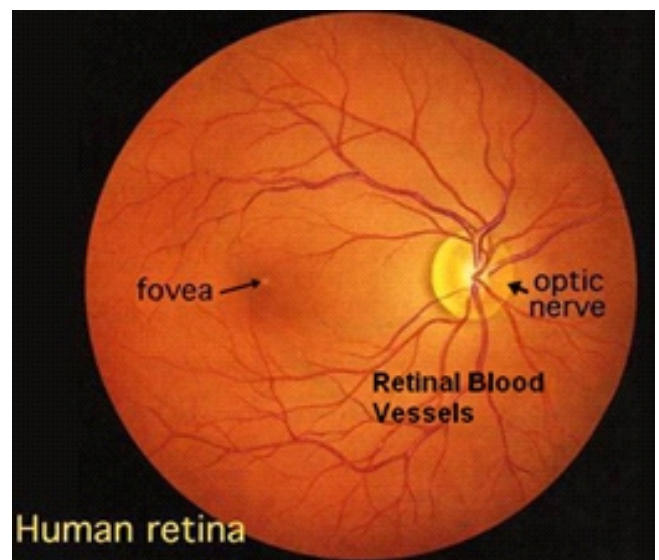


Features in an eye image used to identify the eye affected with Diabetic Retinopathy:

- 1) Exudates - Fluids that filter from the circulatory system into lesions or areas of inflammation. These are small, sharply demarcated yellow or white, waxy glistening patches, often coalescing into plaques. Exudates are of two types:
 - Hard exudates (yellow spots seen in the retina).
 - Soft exudates (pale yellow or white areas with ill-defined edges).
- 2) Microaneurysms - Identified clinically by ophthalmoscopy

usually the first visible sign of diabetic retinopathy. Microaneurysms arise as hypercellular saccular outpouchings of the capillary wall that can be well visualized in trypsin-digest retinal mounts. Their lumina are sometimes occluded by agglutinated erythrocytes or thrombus. Over time they sometimes become acellular, just as damaged retinal capillaries can evolve into "ghost" vessels devoid of endothelial cells and pericytes.

3) Blood Vessels - Blood vessels can act as landmarks for localizing the optic nerve, the fovea (central vision area), and lesions. As a result of systematic or local ocular disease; the blood vessels can have measurable abnormalities in diameter and color.



Let us now go through the basics of what Image Processing and Machine Learning is:

1. Image Processing:

Image processing and analysis techniques are used to extract information from remotely sensed images. E.g. Extracting features of a retinal image

Generally, image processing involves procedures like:

1) Image correction- Applied to correct raw data properties like geometric and radiometric distortions and projection into the desired spatial reference system. To correct these anomalies, we typically use Geometry, Trigonometry, Geodesy (Very complex math like spherical harmonics), Physics equations related to Light (since light is the source of reflection), Interpolation methods, Line and polynomial equations.

2) Images enhancement- It is performed to aid visual appearance and analysis. Contrast improvement, linear contrast stretch, edge enhancement, mosaic, etc. are achieved by making use of Statistics measures like Histograms, skewness, Kurtosis, PCA, etc. For image filtering, Matrices are used by default.

3) Image Classification- Supervised to unsupervised classification of images is performed to discriminate land features based on spectral characteristics of each pixel. Math concepts like Nearestneighbour, K-NN, clustering, scattering-plots, iso data, Fuzzy Classification, Machine learning, etc are used.

2. Machine learning: (Covering Concepts of Convolutional Neural Networks)

Simple cells in the network help with feature detection and complex cells combine several such local features from small spatial neighborhoods. Spatial pooling helps with translational

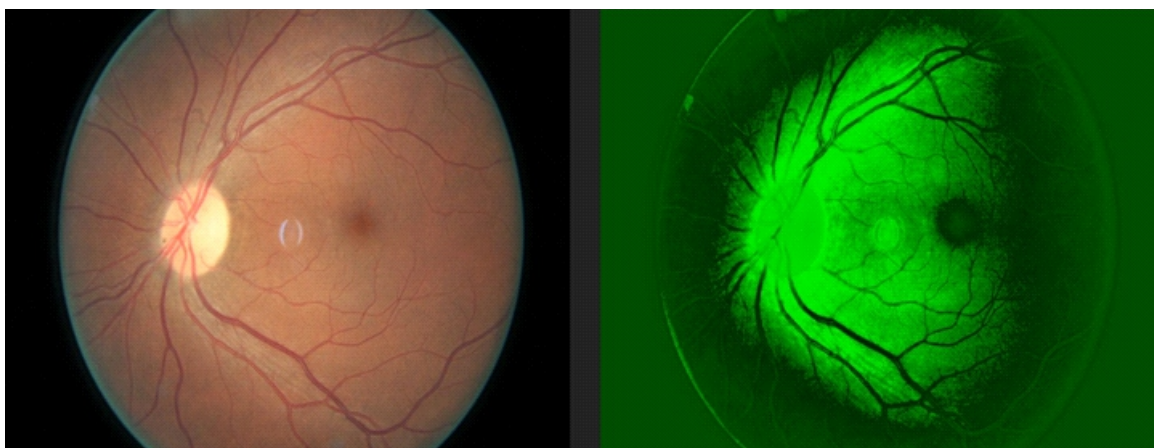
invariant features. When we see a new image, we scan the image left to right and top to bottom to understand the different features of the image. Our next step is to combine the different local features that we scanned to classify the image. This is exactly how CNN works.

What do translational invariant features mean?

Invariance of the image implies that even when an image is rotated, sized differently or viewed in different illumination an object will be recognized as the same object. This helps with object recognition as the image representation is invariant to image transformations such as translation, rotation, or small deformations, etc. We use convolution neural networks for image recognition and classification.

CNN stands for Convolutional Neural Network which is a specialized neural network for processing data that has an input shape like a 2D matrix like images. Convolution is a mathematical operation where we have an input I , and an argument, kernel K to produce an output that expresses how the shape of one is modified by another.

CNN's are typically used for image detection and classification. Images are 2D matrices of pixels on which we run CNN to either recognize the image or to classify the image. Identify if an image is of a human being, or car or just digits on an address. Like Neural Networks, CNN also draws motivation from the brain.



Results of Image Processing Techniques on the Fundus images:

We performed Image Processing on the dataset so as to obtain the desired form of images for further analysis and training of the model.

Step 1: Conversion of RGB images to Grayscale, followed by Histogram Equalisation.



Step 2: Contrast Limited Adaptive Histogram Equalisation to obtain images of better clarity.

Step 3: Do Intensity Equalisation while keeping the images in RGB and applied CLAHE on the Luminous channel of the image.

To perform a better classification of the images, we chose to work on exudates extracted images instead of the normal ones.

Steps for extraction of Exudates:

1) **Gaussian Blur** - Also known as Gaussian smoothing, is the result of blurring an image by a Gaussian function. It is used, typically to reduce image noise and reduce detail.

2) **Morphological Operations** - Morphological operations apply a structuring element to an input image, creating an output image of the same size. In a morphological operation, the value of each pixel in the output image is based on a comparison of the corresponding pixel in the input image with its neighbors. The most basic morphological operations are

dilation and erosion. Dilation adds pixels to the boundaries of objects in an image, while erosion removes pixels on object boundaries. The number of pixels added or removed from the objects in an image depends on the size and shape of the structuring element used to process the image.

3) **Thresholding** - Image thresholding is a simple, yet effective, way of partitioning an image into a foreground and background. This image analysis technique is a type of image segmentation that isolates objects by converting grayscale images into binary images. Image thresholding is most effective in images with high levels of contrast. Common image thresholding algorithms include histogram and multi-level thresholding.

Now let us see the Machine Learning Part:

The train data given is of a specific height, width and channels used. This is done to extract the features of particular channels and use them in the process of CNN. The 3 different models used have given better accuracy each time we increased the layers of the model. We developed 3 CNN models for the classification of Exudates extracted images. Following are the accuracies:

For processed RGB images:

Model 1 - 51.6% training, 50% testing

Model 2 - 52% training, 50% testing

Model 3 - 52% training, 50% testing

Analysis:

On running the models shown above, all the images i.e. including the ones having DR was being classified as 'Normal'. Thus, to check if the data is unclean, we decided on separating the images manually into a binary class - 0 (Having no DR) and 1 (Having severe DR - level 4)

For a data set having manually separated images:

Model 1 - 86.7% training, 87% testing

Model 2 - 92% training, 91.6% testing

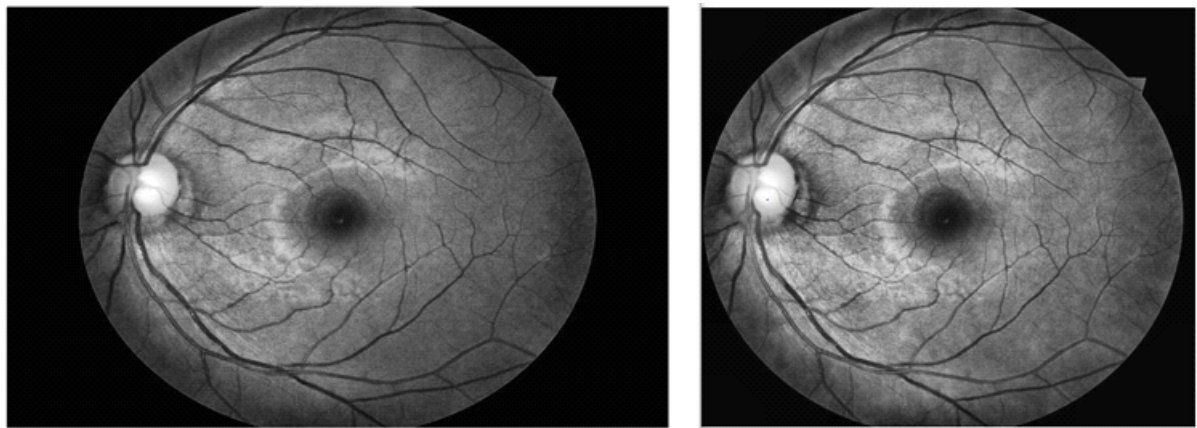
Model 3 - 95% training, 95% testing

Results of Image Processing Techniques on the Fundus images:

Step 1:



Step 2:



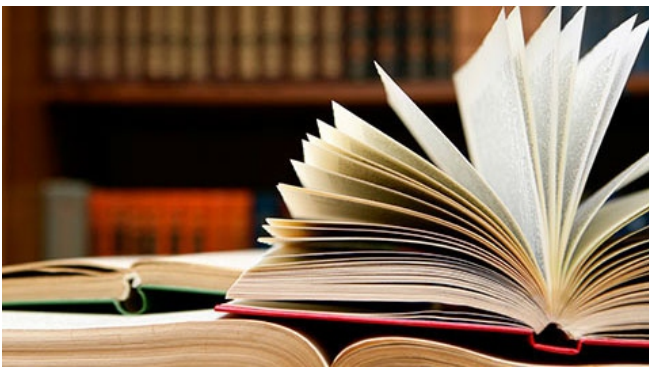
- Written and Compiled by
Sonali Gaitonde
- Co-authors
Mayuresh Shelar
Anurag Sarang
Mradul Mundra

50 Guidelines to improve Instrumentation Technical skills



- Prof. Prasad K. Godse

During engineering, normally students focus on subject theory and definitions, theorems, laws of physics, principles of operation, block diagrams, circuit diagrams, working etc. In laboratory, generally student's intention is to complete given lab experiment by taking readings and filling observation tables, plotting graphs and writing conclusions.



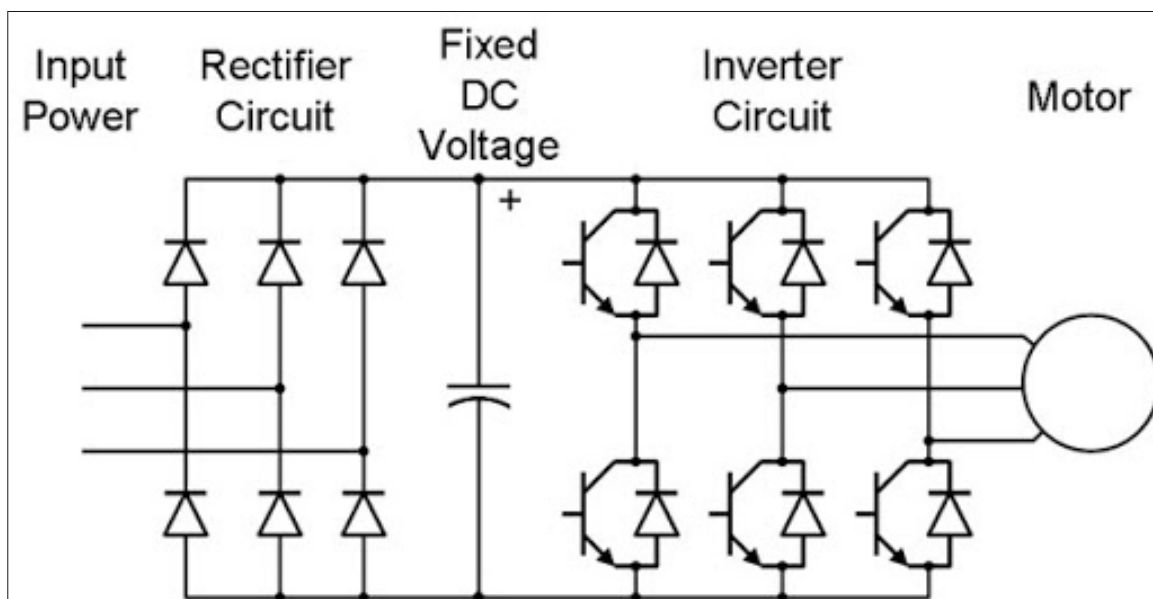
However, if you want to improve your technical skills and become an expert. You must try the following:

- Identify and spend your extra time in the laboratory regularly.
- Trace process flow diagrams / mimics
- Identify various open/close control Loops & instruments with major MOC.
- Be familiar with Laboratory plot plan.
- Understand instrument locations.
- Read and draw equipment GA drawings and piping drawings.
- Practice doing dimension check of process equipments.
- Draw P&I Diagrams of pilot set ups and understand significance of instrumentation ISA symbology.
- Develop ability to read instrument manuals and catalogs from vendors.

- Know your instruments and its features / safety guidelines/ installation details and guidelines.
- Read ISA specification forms and practice of drafting instrument specifications using lab process data and details.
- Learn the air distribution system and air header schedule.
- Learn power supply distribution system and power/ instrument cable schedule.
- Make yourself familiar with Engineering unit conversions.
- Powering the instruments & loops by yourself.
- Check factory configurations and default settings.
- Do settings and configure various instruments.
- Knowing and doing calibration / Re ranging of field instrumentation.
- Doing Tuning and setting controllers.
- Test performance of the instruments by doing practical
- Operate instruments by yourself & monitor outputs with ref to time.
- Test repeatability check for instruments.
- Perform comparative study of various sensors and instruments.
- Understand wiring and logic diagrams by drawings and doing wiring at panels and instruments.
- Practice Cold & Hot Loop check on pilot plant set ups.



- Practicing installation and mounting / removing of instruments.
- Doing Hydro test and seat leakage test as per supplier's guidelines.
- Troubleshooting process control system.
- Learn safety requirements and safety equipment.
- Understand instrumentation software.
- PLC programming and practice Graphics development.
- Understand interfacing techniques for electrical utilities.
- Understand Engineering standards.
- List various applications for each instrument.
- Understand instrument unit price structure and other proposals T&C.
- Technical & commercial bid comparison & Costing of instrumentation in the project.
- Vendor development activities and Engineering purchase for typical I&C project.
- Understand different industrial standard signals and usage of signal converters.
- Learn erection material and its significance.
- Learn and verify instruments sizing / Entry and process and electrical connections.
- Electrical Motors / pumps and VFD Fundamentals.
- Prepare list of recurring maintenance for various field and panel instruments.
- Prepare list of spares generally required for Field instrumentation.
- Understand control cabinets and accessories
- Develop modern control room layout requirements.
- Develop charts / drawings of Hazardous areas and safety instruments.
- Study interoperability concept
- Study chemical processes in various industries.
- Familiar yourself with Fire and safety standards as well as ISO certifications.
- Study selection criteria for Field & Control room instrumentation.



“Kuch Creative Corona!”- Featured Artworks



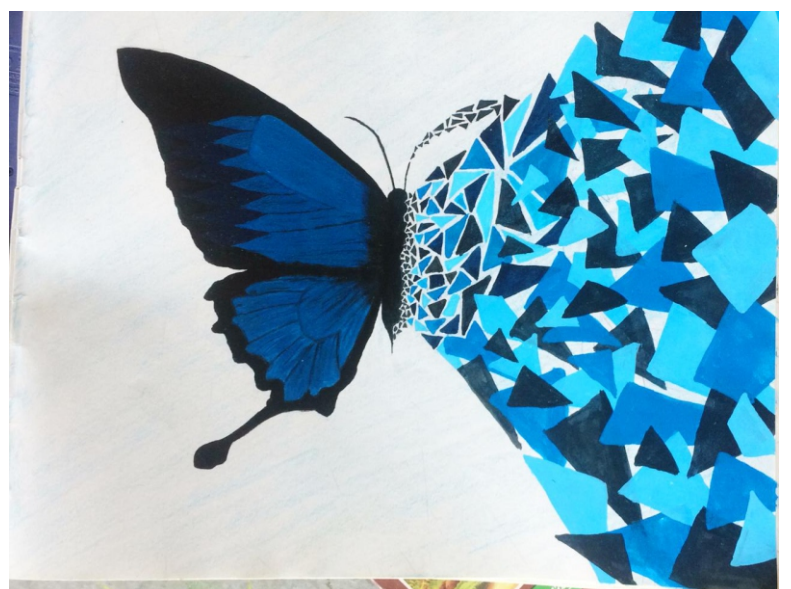
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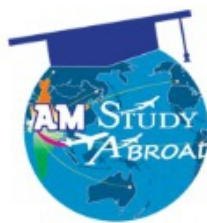
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