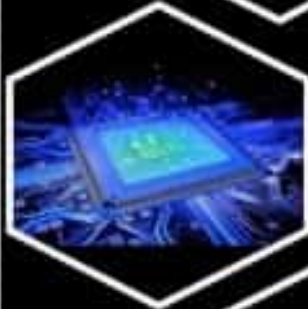


May 2020

# Tech Reviewee !!

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IEEE BITS pilani  
Student chapter



# Editorial

**We are a group of enthusiastic, tech-freaks working towards enriching and inspiring a sense of curiosity towards the vast world of electronics and computation.**

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# INDEX

○ Artificial Intelligence .....	3
○ Quantum Computing .....	8
○ Latest Innovations .....	13
○ Amazon Go .....	16
○ Fusion Energy .....	20
○ CES 2020 updates .....	25

# ARTIFICIAL INTELLIGENCE

~ BY EKANSH GUPTA  
2019A4PS0368P



# Artificial intelligence – What, Where, and How?

Artificial Intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think like humans and mimic their actions. The term may also be applied to any machine that exhibits traits associated with a human mind such as learning and problem-solving.

The ideal characteristic of artificial intelligence is its ability to rationalize and take actions that have the best chance of achieving a specific goal.

When most people hear the term artificial intelligence, the first thing they usually think of is robots. That's because big-budget films and novels weave stories about human-like machines that wreak havoc on Earth. But nothing could be further from the truth.

Artificial intelligence is based on the principle that human intelligence can be defined in a way that a machine can easily mimic it and execute tasks, from the most simple to those that are even more complex. The goals of artificial intelligence include learning, reasoning, and perception.

AI is continuously evolving to benefit many different industries. Machines are wired using a cross-disciplinary approach based in mathematics, computer science, linguistics, psychology, and more.

Nowadays AI technology is employed in safety critical situations such as airports, ATM machines and aircraft operations. When decision makers and business executives have reliable data analysis, recommendations and follow-ups through AI systems, they can make smarter decisions and better choices for business, employees and future actions.

## Artificial intelligence generally fall under two broad categories:

□ **Narrow AI** : Sometimes referred to as "Weak AI" this kind of artificial intelligence operates within a limited context and is a simulation of human intelligence. Narrow AI is often focused on performing a single task extremely well and while these machines may seem intelligent, they are operating under far more constraints and limitations than even the most basic human intelligence.

For example the cameras we use in our mobile phones, personal assistants like Siri, Alexa and others, Google search, image recognition software, self-driving cars and many others.

□ **Artificial general intelligence** :

AGI, sometimes referred to as "Strong AI", is the kind of artificial intelligence we see in the movies, like the robots from Westworld or Data from Star Trek: The Next Generation. AGI is a machine with general intelligence and, much like a human being, it can apply that intelligence to solve any problem.



## How AI Works ?



Artificial intelligence is nothing but a program algorithm, it can be anything from finding the best hotel prices, booking tickets for anything, voice search and even image recognition or search.

That was the software part, coming to hardware, you will require an actual camera for image recognition, or a mic for voice search and a processing system on which you can actually store the algorithm and run it, like a laptop or a PC or even a mobile phone.

So combining all this doesn't mean that you have an AI system up and running. You still have to TRAIN your system i.e. your algorithm has to run over and over again many number of times in order to get CORRECT results or to function properly.

The above step is what can be said as the crux of the whole AI system. It is called machine learning.

AI system has a neural network, this is the place where your input data is stored in pieces, this is the BRAIN of an AI and the process of understanding your AI better here is known as deep learning. You can actually TEACH an AI by various learning methods like supervised learning, unsupervised learning and lastly reinforced learning.

# Machine Learning and Deep learning

Much of Narrow AI is powered by breakthroughs in machine learning and deep learning. Understanding the difference between artificial intelligence, machine learning and deep learning can be confusing. Venture capitalist Frank Chen provides a good overview of how to distinguish between them, noting:

*"Artificial intelligence is a set of algorithms and intelligence to try to mimic human intelligence. Machine learning is one of them, and deep learning is one of those machine learning techniques."*

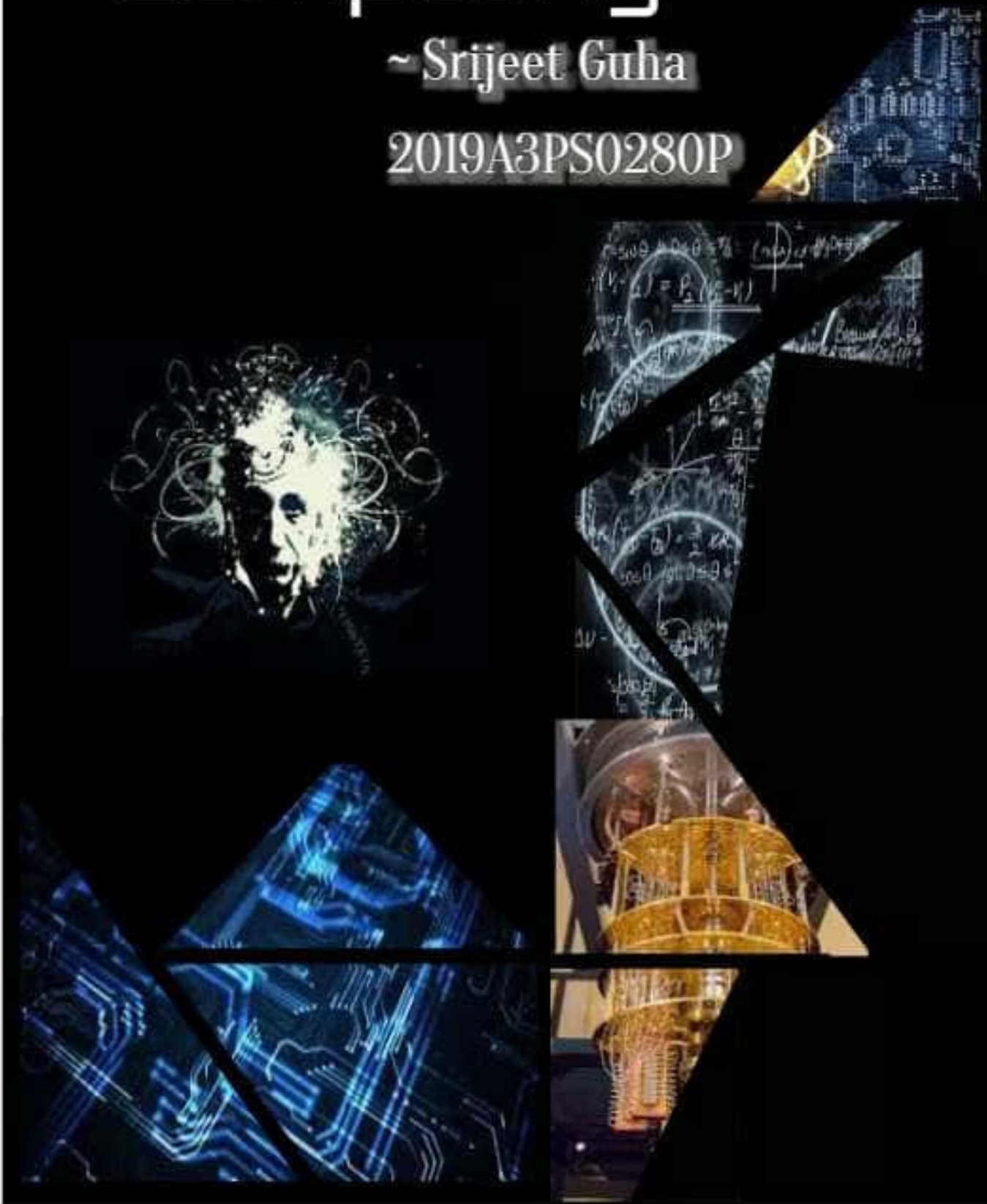
Deep learning is a type of machine learning that runs inputs through a biologically-inspired neural network architecture. The neural networks contain a number of hidden layers through which the data is processed, allowing the machine to go 'deep' in its learning (hence the name), making connections and weighing inputs for the best result.



# Quantum Computing

~ Srijeet Guha

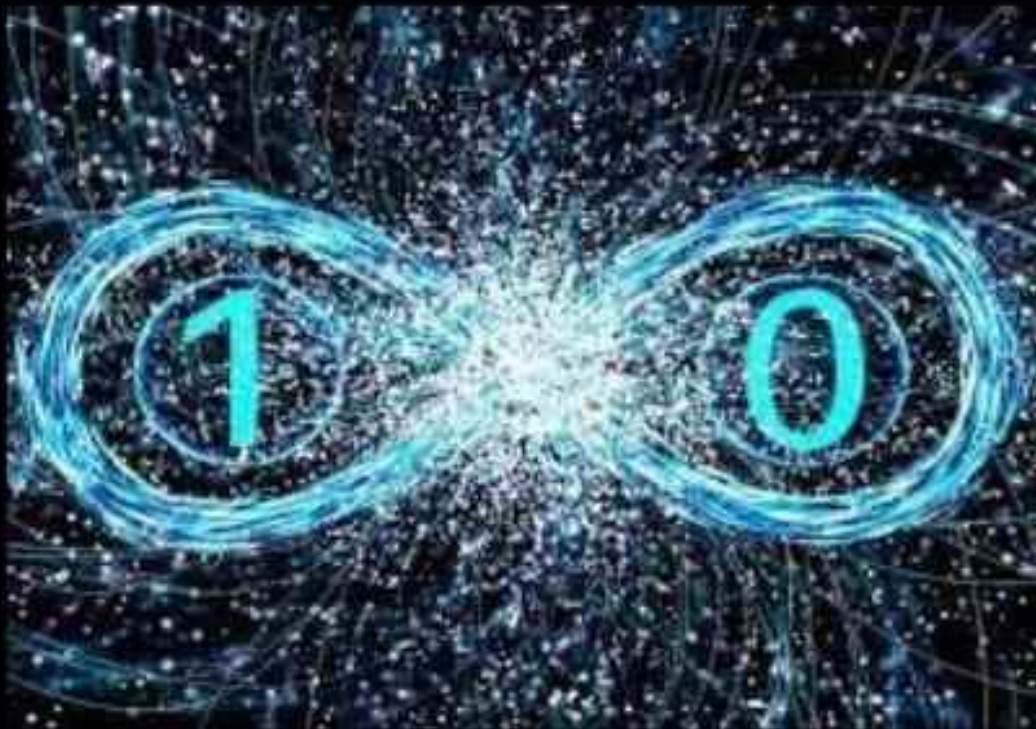
2019A3PS0280P



# What are Qubits?

All computers around the world today uses bits or zeroes and ones for computation, mathematical simulations and storage of data. These bits are basically transistors which are either in a state of high potential or a low potential which signifies ones or zeroes respectively.

With the advent of Quantum Supercomputers, we tend to replace the traditional bits with qubits or quantum bits which will provide the computers much more computational power, lesser time required for simulations and more specifically more storage space in a given area.

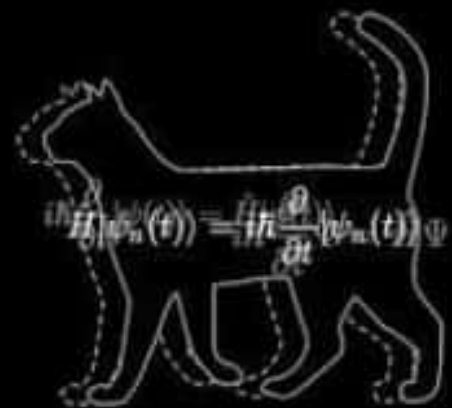




# Superposition

Superposition basically refers to co-existence of two states which by classical mechanics are independent of each other. For, example a fair coin can be tossed to get either a head or a tail but if the principle of superposition is applicable then a coin can give a mixed state of both heads and tails with a time variant probability of the same.

Similarly, a computer bit which originally existed only as zero or one may now have a state intermediate to both the above states with a time variant probability.





# The Challenge.....

*" If you arent really confused by quantum mechanics, then you haven't really understood it."*

Now the main task is to use these quantum properties for computation in a quantum computer. Where traditional computer bits are made of transistors, qubits are made of atoms, ions or semiconducting molecules which are capable of exhibiting quantum properties. These qubits need to be isolated well enough so that their entanglement properties can be controlled and must be cooled at sub-zero temperatures so that the qubits exhibit the quantum properties. Qubits are cooled by mainly two subsystem refrigerators which maintain the qubit temperatures to ten milli-kelvin.

The computer algorithm uses microscopic wave pulses to generate deviation in the quantum states of the respective qubits. The algorithm enforces entanglement, interference and superposition of quantum properties of the qubits to generate mixed quantum states of qubits which are measured later again using microscopic pulses to get the information stored in these qubits. Since each qubit can carry much more information than a traditional bit, the storage space available in a particular space increases, and the computation power increases.



# So, what is that we as undergraduates can do with supercomputers?

There is a plethora of options that are available for us, students, that we can explore and be a part of. Listing two such options that can bring about a positive impact on how we perceive quantum computing :

## 1) Quantum for developers

Be part of a vibrant community and dive into quantum programming with Qiskit, IBM's open source, full stack quantum software framework. Or get started quickly, run experiments, and work with quantum circuits on the IBM Quantum Experience - the most widely used and accessible quantum cloud platform.



## 2) Quantum innovation for you

Put your imagination to work with all the quantum development tools you need. Develop algorithms for practical applications and run them on IBM Quantum

# INNOVATIVE PRODUCTS

~ By Jash Shah  
2018A8PS0507



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## Hot Stuff

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We bring some of the most innovative products of 2019-20. Behold the technology.

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## Ocutrx Vision

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An augmented reality headset that will function as a tool for vision correction. SLAM and mapping capabilities for AR AI to detect the blind spots  
Auto brightness.

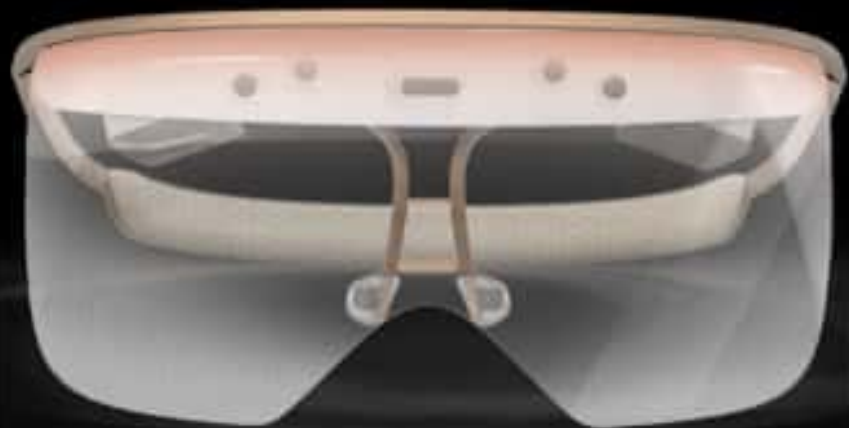


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## Roveo

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Agile robot for security monitoring in any environment . It Combination of 3D laser scanning, night vision, thermal vision and acoustic analysis .



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## Mind OS 2.0

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Robotics-optimized Operating System integrated with OpenCV, ROS and other AI libraries.





## Sunflower

Automatically controlled robot by the sun's direction.

Opens up in the morning and closes at sun down. Also, ALEXA, and Andriod enabled.



## Alternate Reality Skin

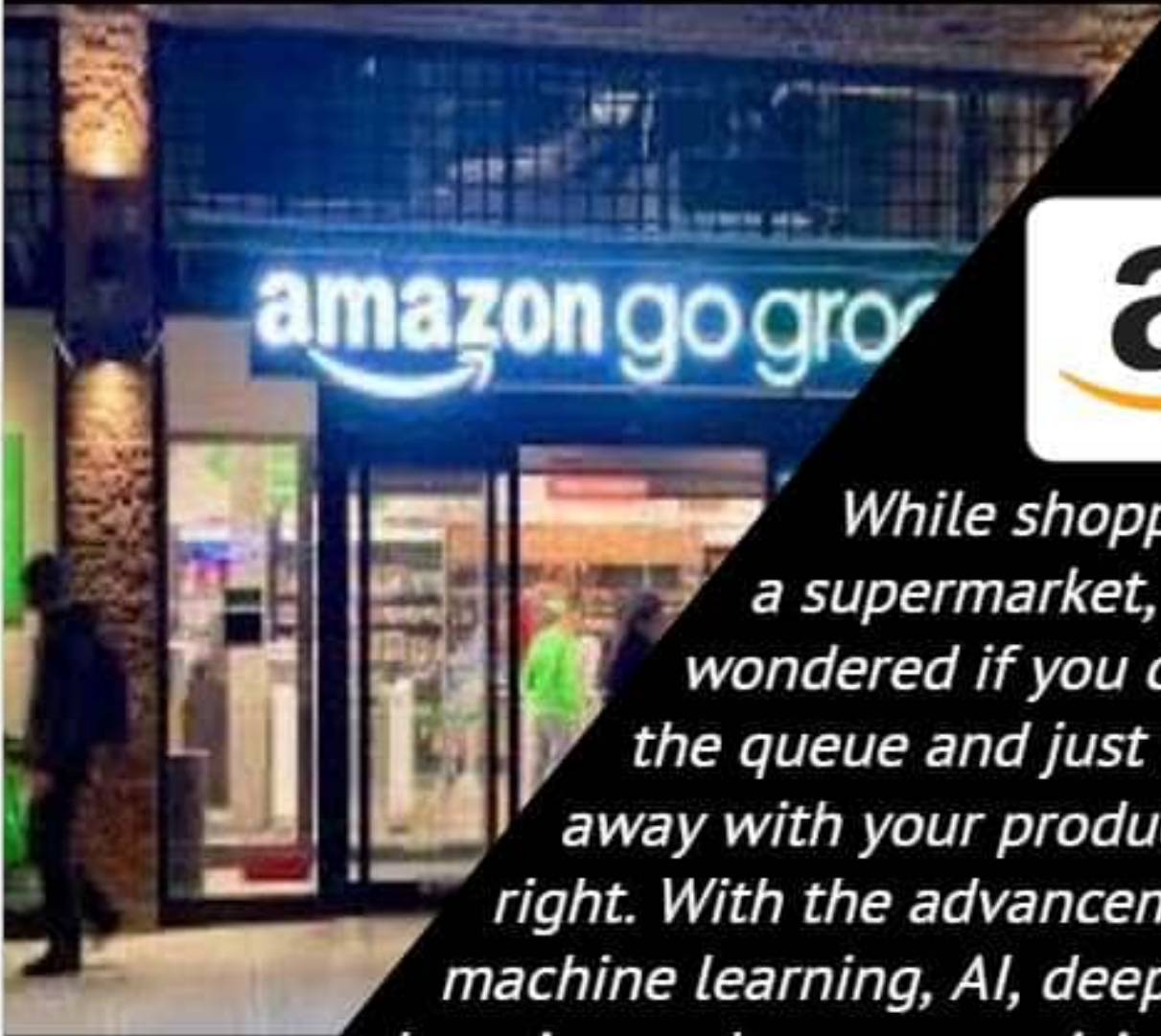
The wireless, touch-sensitive interface worn over skin sends vibrating signals through the skin layer. Wearing gear that produces exact voltage and current combination to produces simulation. It is battery-free platform of electronic systems, along with a wearable, soft, interface.

## Lunar cell

In this device light is instead emitted and the current voltage go in the opposite direction, generating power.







*While shopping in a supermarket, ever wondered if you can cut the queue and just walk away with your product? No right. With the advancement of machine learning, AI, deep neural learning and computer vision, Amazon Go stores let you do just that !!!!*

# Amazon GO

*-Roshan Agrawal  
2019B1PS0191P*



## ***Amazon Go - The future of shopping is here !!!!!!!!!!!!!***

*Amazon Go has 26 open and announced store locations in Seattle, Chicago, San Francisco and New York City as of 2020. The flagship store has prepared foods, meal kits, limited groceries, and liquor available for purchase.*

*This is what it looks like from a customer's point of view- You walk in store and scan your QR code on amazon Go app , the turnstiles let you in. You grab any item you want from store and just exit. Your order is viewed on virtual cart and charged from your amazon account. The detected items are generally correct. In case you were charged wrong, you can refund it from your app.*

*Now let's get in core stuff, how it was implemented!*

*The technology is not out on paper officially by Amazon yet, but experts have speculated what they could understand.*

*Amazon has combined the powers of Artificial Intelligence , machine Learning, image recognition, an array of fusion sensors and decades of data on how humans shop.*

*The data gathering devices used by Amazon in its smart store are the multiple cameras present on ceiling, weight sensors, RFID tag, a volume displacement sensor, pressure sensors, infrared sensors, load cells, safety light curtains, GPS inside the customer's smartphone and bluetooth tag. An RFID reader, will be located at or near the transition area and collect data that will be processed to determine that a customer is entering and/or passing through the gate of the Amazon Go store. The cameras are used to identify customer's face. Strain gauge transducers may be positioned on the surface of the transition area to detect when a customer is passing through the gate of the store.*

*Once the presence of the customer inside the store is detected, customer data will be collected by one or more of the data gathering devices located in the Amazon Go store and will be used to identify the customer. A customer is identified using facial recognition techniques and other customer identification methods such as QR code scanning and providing a unique PIN representing the customer.*



*Further, the camera located within the store will collect images of the store that will be used to detect the presence of the customer inside the store near a specific item on the shelf. Amazon can also collect customer's GPS information using his smartphone to determine the exact location of the customer inside the store. For this store to become practically possible, it is very important to detect whether a product is picked from the shelf. Also, the product which was earlier picked by the customer can be returned back on the shelf and the detection of this step is also very essential for the working of the Amazon Go model.*

*To achieve the above-mentioned objectives, Amazon make use of image detection for determining whether the product is picked or not by the customer. For example, images of the customer's hand can be captured and image analysis can be performed to detect whether the customer has picked any product from the shelves or not. Amazon Go store will also be able to detect the skin tone color of the user's hand to enable accurate detection of the products. Also the images are backed by information provided by weight sensors, volume displacement sensor and pressure sensors. All these sensors are present on each shelf of the store. An infrared sensor placed near the shelf is also be used to distinguish between a user's hand and items.*

*Uses of light curtains and RFID tag / NFC tag / Bluetooth tag to the exterior of a product are also speculated.*

*After determining the product picked by the user, a unique identifier representing the picked item will be linked with the customer profile to represent that the customer has picked this item. If the customer has placed the picked product on the shelf again then the unique identifier representing the product will be removed from the customer's profile data.*

*The customer profile data store may be updated regularly to update the list of the items/products that are picked by the customer. Customer will also be able to see the details of the items picked by the customer on the Amazon Go app installed on his smartphone in real-time.*







# Fusion or Illusion!!!!



The ultimate  
energy source

~ Pranat Kashyap  
2017A3PS028IP

The last few months have been tumultuous. Every nation, every government, every celebrity and every ordinary citizen has witnessed unimaginable changes everywhere and every way possible. While the SARS-COVID-19 (more popularly called the Coronavirus) has been infecting millions around the world, major cities around the world have been locked up with major industries and daily lives coming to a grinding halt .

This has had various effects. One being the huge fall in demand for energy resources including oil. Additionally, the oil price war between Saudi Arabia and Russia sent oil prices into a nosedive.

At the same time, the climate problem does not seem to go away. In spite of lockdowns in most industrial hubs, April became the warmest April ever on record globally and 2020 is on track to be the “warmest year ever”.

This showcases the problem of global warming- the worst consequence of using non-renewable energy resources like oil, gas and coal. Is the fall in demand and rise in global warming rates of oil telling us to look for alternative fuels? If that is so, the next energy source must be Fusion Energy!!



## Why Fusion Energy?

Fusion energy uses an inexhaustible fuel, has no emissions, doesn't emit any carbon, doesn't have meltdowns, doesn't take much land, and can run all the time. What more do you want from a source of energy? In spite of the huge promise, people often disregard these claims as fantasy due to fusion energy being "too good to believe". But fantasy often comes out to be reality- that's what Isaac Newton would say if you travel back to the 17 th century (well...somehow) and show him the features of a smartphone.

## What? From where?

People often confuse Fusion energy with Nuclear energy and immediately relate it with nuclear disasters and shove off the idea of using fusion energy. But actually Fusion energy is different from nuclear energy. Nuclear energy come from splitting an atom's nucleus into two or more, while Fusion energy comes from combining two nuclei into one. The most common fusion happens inside the sun. The hydrogen-helium fusion powers the sun and that is why the sun is hot and bright. On Earth, every kind of energy we use currently originated from solar power. So, why not use the Fusion energy directly?



# The Fusion Reactor

A theoretical fusion reactor works like a "little sun". A super-hot environment is created where fusion reactions occur. These reactions produce enormous amounts of heat which is captured by the plant and is used to drive a turbine. The fuel for the reactor is obtained from isotopes (or variants) of hydrogen- Deuterium and Tritium. The exhaust is helium, which in no way harms the environment, like carbon dioxide, nitrogen oxides or sulphur oxides do. Moreover, helium is stable and non-toxic, so it does not affect the surroundings as radioactive nuclear wastes do. But is a Fusion reactor as hot as the sun? The inside temperatures of a Fusion reactor can range around 150 million degree Celsius! That is seven times hotter than the sun. Seems like our "little sun" is far less tame than the actual sun. At this temperature, the material turns into Plasma- the fourth fundamental state of matter after solid, liquid and gas. Plasma is a superheated gas form in which the electrons separate from the nuclei and create a sea of electrons. But this superheated plasma does not melt the reactor. This is because it is extremely sparse. In fact, it is so less dense that it has fewer particles than a breath of air. The only problem with plasma is that it needs to be insulated well, else it cools down quite easily.

Most researchers insulate the plasma with "Tokamak", a donut-shaped device with a very strong electromagnetic field. The plasma, being a sea of electrons, can be isolated from the surroundings by the magnetic field of the Tokamak. The largest Tokamak is being currently built in the south of France called ITER. It is estimated to cost about 50 billion dollars and is already halfway through its construction. ITER is expected to be functional by 2026.

## Is it safe?

One of the keys to safety of Fusion reactors is the fact that there are no chain reactions involved in a fusion reaction. A chain reaction feeds itself and is self-sustaining. As a result, once the chain reaction goes out of control, it becomes extremely difficult to bring it back under control. This is the primary explanation behind the nuclear disaster in Chernobyl and the meltdown in Fukushima. But a fusion reaction has no chain reaction. This means it can be easily kept under control. Besides, the total thermal energy in a fusion reactor is extremely low.

This makes disasters and hazards extremely improbable in a fusion power plant, though there can, of course be hazards common in power plants involving toxic gas leakage or high-voltage electricity.



# The "best energy" source?

Fusion energy is extremely dense, which means that the amount of energy that can be extracted from it is extremely high. One of the most powerful metrics to judge the efficiency of a power source is to calculate the ratio of the power obtained from it to the power consumed by it. This ratio was 0.00000001 when fusion research began. With more advancement, it is 0.7 now and is only expected to improve with more research and studies. ITER is expected to have a far higher efficiency ratio. Additionally, the Commonwealth Fusion Systems (CFS) in collaboration with MIT is planning to make superconducting magnets using REBCO (Rare Earth Barium Copper Oxide), which will increase the efficiency manifolds.

Bob Mumgaard, the CEO of Commonwealth Fusion Systems (CFS), in an interview called Fusion energy "the last fundamental form of energy humanity will ever discover" - a huge statement. But nevertheless believable considering the fact that at the current projected rate of energy usage (taking growth into account), the amount of energy we have, in just the amount of extractable isotopes of hydrogen is enough to last the Earth for many magnitudes of years longer than the remaining life of the sun. This essentially means that the sun will die even before the usable fusion energy of the earth burns out completely. Thus, it is probably the last and also the "Best energy source" for the man from the future.





~by Moksha Agrawal  
2019A7PS0106P



## About CES (Consumer Electronic Show)



Owned and managed by the Consumer Technology Association, the Consumer Electronics Show is the leading annual trade show held in Las Vegas Convention Centre in Las Vegas, Nevada in the United States of America.

It is the top gathering place for the industry's leading technology experts. Cutting edge innovation and inventions in the field of consumer electronics have always been presented here. CES is the place where the top leaders in tech-business launch their latest advanced products.

Since the last few years, CES has become the place, where almost every new product has been introduced and adopted by the general population. The last CES boasted with a total attendance of approximately 175000. The total exhibiting companies was a whopping 4500 and there were approximately 1000 speakers and panelists.

Started in 1967, the CES has been the breeding ground for latest technology since more than 50 years. The CES this year went on from 7th January to 10th January 2020 encompassing a number of events. American businesswoman and senior advisor to the US President, Ivanka Trump, served as the keynote speaker and Apple Inc made its first appearance in this CES.

From here on, we will be covering the major releases of CES 2020....

## # Smart home technologies

### Kohler Moxie

Kohler and Harman Kardon partnered for this setup. The showerhead releases a steady ring of water while the cutout fits the magnetically secured Alexa-integrated smart speaker. Bathroom singers can take their vocals to a good use and have fun while taking a shower.

### August Wifi Smart Lock

The Smart Lock upgrades your deadbolt. You will be able to remotely lock or unlock the door, check door status, grant virtual guest keys, and see who's coming and going, while you're away from your home. It is easy to install and attaches to your existing deadbolt and you can use your favorite audio assistant on it, which makes it even more attractive.

### Samsung Ballie

Samsung Ballie is a ball shaped gadget, equipped with cameras and sensors used to follow you around. It can control various smart home features, take photos, send you updates about your home when you are away. It basically becomes your home-caretaker and looks after your home, while you're away.

## # Smart Phones

### Oneplus concept one

OnePlus arguably over hyped Concept One, but the vanishing cameras on the new concept phones are still cool. The phone uses a thin layer of electrochromic glasses to make the cameras on the back disappear when not in use. This gives the phone a much better look, combined with the other popular features of being a OnePlus phone.



## # Audio technologies

### TCL Alto 9+

TCL Alto 9+ is a feature-packed sound bar offering Dolby Atmos and Roku TV connectivity at a relatively lower price. Dolby Atmos no longer requires you to fill your room with hundred of speakers, with the next gen, object based audio technology now wriggling its way into products of all shapes and sizes.

### Jabra Elite Active 75t

This Jabra product is similar to the Jabra Elite 65t. These earbuds are durable with an IP56 rating. It has a 4-microphone array with Jabra & digital signal algorithm and is absolutely convenient to use due to the algorithm. Moreover, it is water-proof and sweat-proof, which means it can be used any time and anywhere.

## # Latest Gaming Tech.

### Alienware Concept UFO

Dell presented this interesting concept when it comes to PC gaming-on-the-go with the Intel-powered Alienware Concept UFO. The portable Windows PC, which mirrors the form factors of the Nintendo Switch, features an 8-inch display, kickstand, detachable controllers and support for external devices like displays or a keyboard and mouse.



# # Automobile Industry

## Mercedes-Benz

At the most theatrical car presentation of CES, Mercedes-Benz showed off the VISION AVTR, a far-out curvy concept that looks straight out of the movie "Avatar". The car will also use graphene-based organic batteries which eliminates toxic metals.

## Lamborghini Huracan

Amazon and Lamborghini featured a flashy display of the Lamborghini Huracan EVO with a new Alexa integration to control seat heaters, interior lights, climate and other settings through voice command while focusing on the road ahead. This makes Lamborghini the first car manufacturer to provide in-car smart control. The Human Machine Interface (HMI) will continuously update the installed Alexa software with latest innovations.

## Sony's Vision-S with the Safety Cocoon

One of the biggest surprises at CES-2020- Sony had a concept car on display! Can you believe it?

If you think Sony is getting in the business of making cars, that is not the case. It just built a vehicle to show off the company's latest cameras, sensors and communications technologies. Sony calls it the "Safety Cocoon", which will provide a 360-degree view to the car, implying extra safety and

