

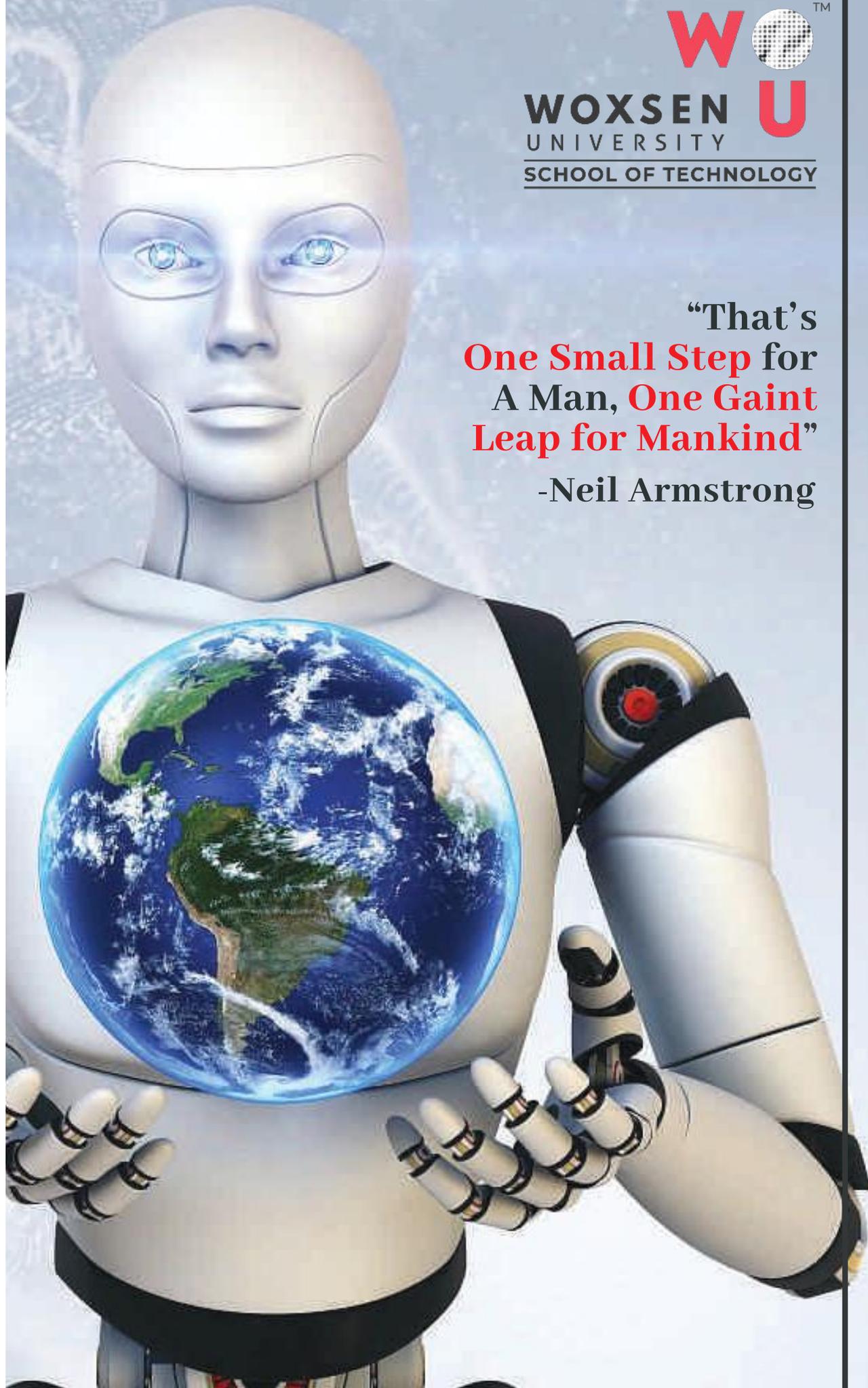
2021 ISSUE #4
(MONTH: AUGUST)

TECHZONE



WOXSEN
UNIVERSITY
SCHOOL OF TECHNOLOGY

**“That’s
One Small Step for
A Man, One Gaint
Leap for Mankind”**
-Neil Armstrong



INDEX

PAGE NO.

ALGORITHMIC FAIRNESS
BY MANJITH REDDY

3

PILL CAMERA
BY SAI GUNAVARDHAN

5

EDGE COMPUTING
BY PALAK GOEL

6

**EFFECTIVE PLANNING VIA MACHINE
LEARNING AGAINST NATURAL DISASTERS**
BY DR. BALAJI VENKATESWARAN

9

**SAVE SPACE ON YOUR LAPTOP AND IN
THE CLOUD BY COMPRESSING FILES**
BY PROF. AMOGH DESHMUKH.

10

HOW GOOGLE SEARCH WORKS
BY KINSHUK SUNDER REDDY

12

ROLE OF AI IN RENEWABLE ENERGY
BY DR. BALAJI VENKATESWARAN

15

SPACE TECH
BY ADITHYA HAVALDAR

16

Editor's



ADITYA HAVALDAR,
EDITOR-IN-CHIEF



VAIGARA SATHI,
EDITOR



VARUNTEJA,
EDITOR



Technology plays an important role in our lives especially during times of difficulties where it becomes difficult to survive without innovations. TECHZONE hopes to inform you about some of the excellent developments different industries are undergoing, and also about the people behind them. We wish these stories inspire and motivate you to achieve your aspirations and provide an insight into the changing world around us .

We sincerely thank all our editorial board members for designing this magazine and making it look so attractive and meaningful and I also thank all the authors for contributing their articles to this magazine. This magazine gives a brief presentation about the activities and Tech talks and much more about technology . This magazine is a platform where students exhibit their skills

Algorithmic **fairness**

By Manjith Reddy

What is an algorithm?

An algorithm is series of steps that must be followed to complete a task. This we also experience in daily life like cooking, driving, etc. There must be specific rules to complete a task. In terms of computers, they need instructions to complete a task or give output according to the problem statement.

Why does an algorithm need fairness?

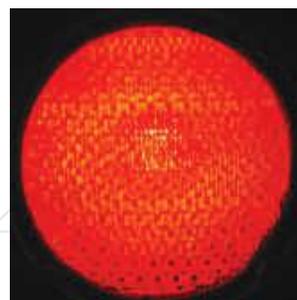
The standard algorithms are used in apps, websites, banking sectors, security, etc. These programs or algorithms need to perform the same tasks repeatedly and only have bugs and efficacy problems that can be corrected by looking into the program. But the Machine learning algorithms learn and keep on updating themselves depending on the data provided; as humans write these self-learning algorithms, they inherit or contain some bad habits of humans, which comes out or results in bias. In simple words, let's say we have created an algorithm that

predicts a person's height depending on his age. Now we start to train the algorithm on the data we have. as we keep on training, the algorithm will be updating itself to predict the outcome more precisely. However, there will be a bias (prediction error) generated in the process of updating, which results in false predictions. Now, finding out where the tendency is getting caused is tricky because the person who will be debugging the program will not recognize and analyze the changes that the program has done to itself during training.

Autopilot

Algorithms are written to drive cars and planes. These algorithms depending on the trained data they create a set of instructions on their own to drive. These separate sets of instructions that are generated by the algorithm are known as black-box algorithms. Even the programmer doesn't know what goes inside these black-box algorithms. If a pilot or a driver has written the program, then the set of instructions to drive will be provided by them, making the program transparent. But the machine learning algorithms are written so that they have to learn how to drive from their surroundings in the process of learning; they create their instructions that cannot be understood. Here lies the problem: it has made a rule that a car has to stop whenever it sees a red color. Now it will stop even if it sees a red balloon.

This bias cannot be recognized by the programmer because this instruction lies inside the black box. To correct this, the algorithm must be trained so that it should be able to tell the difference between red light and red balloon. This bias can be corrected through proper training. Still, there will be other biases inside the black box that the programmer must update manually. Therefore, he must improve the algorithm, which creates these black box instructions to reduce the bias by which the algorithm's fairness can be increased.



Compass software (Correctional Offender Management Profiling for Alternative Sanctions)

This is a machine learning algorithm used by the U.S in various judiciary sections to predict that a criminal will re-offend if bail is given. One hundred thirty-seven inputs such as age, gender, and the offender's criminal record are given as input to the program. Based on this, the algorithm will be giving a rating on a 1-10 scale. Rating 1-4 are considered as non-re-offenders, and bail is provided to them. Rating from 5-10 is considered to be more likely to re-offend if bail is given. So they will be sent back to prison. As mentioned above, these algorithms are written by humans; they inherit some terrible qualities of humans; in these cases, racism is the bias inherited or planted into the program unknowingly. By this, biased outputs are given, and

and these are believed to be correct by the humans, and so does the program.

Even the 137 inputs do not contain any feature like race, but it includes variables that strongly correlate with the color. This means the color is acting as an invincible variable which is affecting the output. This means that if a white American and a black American commit a same crime then there is a high chance that black will be imprisoned and the white will be released on bail. This is mainly because the data set on which the algorithm is trained contains less information about blacks. Most of the information will favour whites because the previous records were biased through racism.

	WHITE	AFRICAN AMERICAN
Labeled Higher Risk, But Didn't Re-Offend	23.5%	44.9%
Labeled Lower Risk, Yet Did Re-Offend	47.7%	28.0%

In the above figure, we can see that the percentage of whites who had labelled high risk but did not re-offend is less than blacks. This means that a black which is high risk labelled is less likely to commit a crime than a white. And the percentage for white who is labelled low risk but still commits a crime is higher than black. So low risk labelled blacks are less likely to commit a crime over a white.

Improvement in fairness

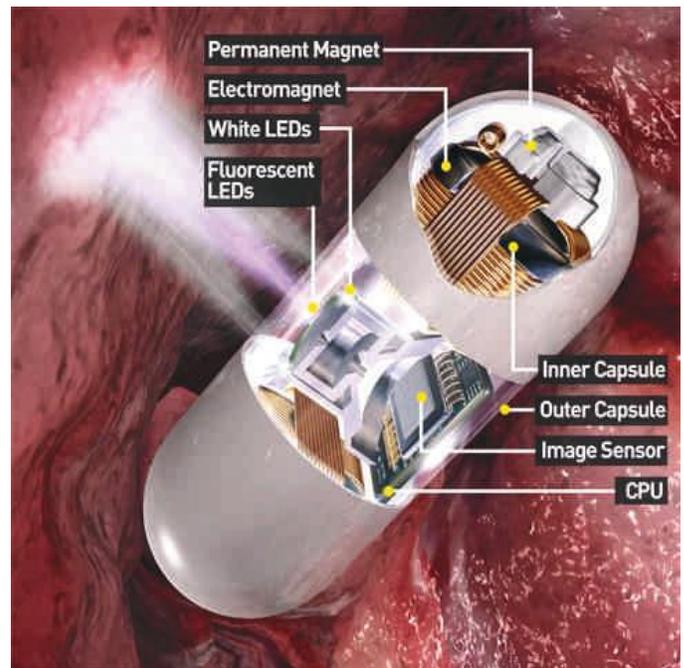
- Collection of data must be in such a way that it must be fair for both blacks and whites.
- The cut-off for blacks to labile them as high risk must be raised.
- The features used should have no correlation or less correlation with color.
- The group of people who write the program must contain both blacks and whites in them.

Pill Camera

By V Sai Gunavardhan

Algorithms are written to drive cars and planes. These algorithms depending on the trained data they create a set of instructions on their own to drive. These separate sets of instructions that are generated by the algorithm are known as black-box algorithms. Even the programmer doesn't know what goes inside these black-box algorithms. If a pilot or a driver has written the program, then the set of instructions to drive will be provided by them, making the program transparent. But the machine learning algorithms are written so that they have to learn how to drive from their surroundings in the process of learning; they create their instructions that cannot be understood. Here lies the problem: it has made a rule that a car has to stop whenever it sees a red color. Now it will stop even if it sees a red balloon.

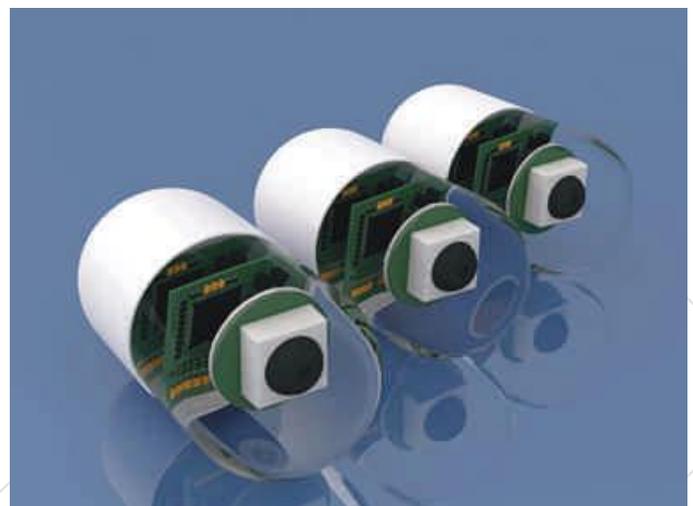
This bias cannot be recognized by the programmer because this instruction lies inside the black box. To correct this, the algorithm must be trained so that it should be able to tell the difference between red light and red balloon.



The work of a gastroenterologist became easy since the capsule endoscope came into view. The following issues can be diagnosed by a doctor with the help of capsule endoscopies

1. Celiac disease
2. Abdominal pain (24 hours stomach pain)
3. Tumors in the intestine can easily be detected
4. Early detection of gastrointestinal cancer

A patient who needs to be treated by capsule endoscopy doesn't need to be sedative and anesthetic; instead, he should follow a diet the day before the test. The very next day, the patient swallows the capsule and is asked to wear the recorder belt around their waist during the trial. The patient should eat a light meal and clear liquids about two hours after the pill consumption. For approximately 8 hours, the patient should wear the belt, and after that, the recorder belt will be removed. The images get downloaded into a computer for physician viewing; then, the capsule will be eliminated typically from the patient feces.





This process involves infrequent complications like if the capsule gets stuck in the narrow passage, then the patient should be treated by bowel obstruction.

After the capsule endoscopy, the patient can get back to his normal activities and typical food. The results will be handed over to the patient within a week.

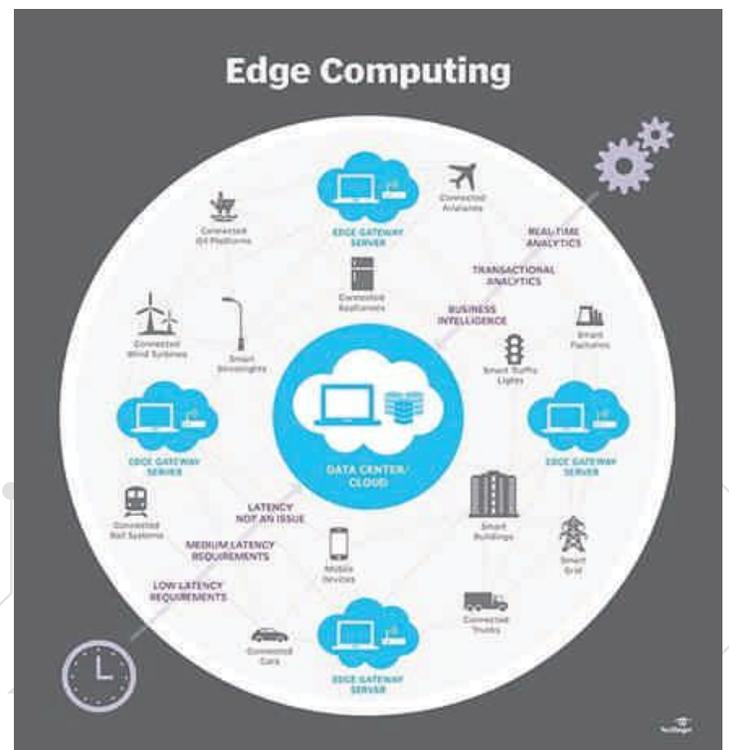
EDGE COMPUTING

By Palak Goel

It is the age of newly rising technologies. We have heard of different fancy names such as Mixed Reality, cloud computing, Honeypot, etc., and among these names, we have even heard of “edge computing” technology. What is this edge computing?

To answer that question, we must understand that the current age has acquired lots and lots of data that needs more efficient management methods. The industry is moving from using its own set of servers to cloud computing and using cloud servers such as AWS. Since all of this data is being looked after such heavy machinery and equipment, it gets a little trickier and cumbersome for a single person to access his data and make changes to or regarding it because of the transfer of data from the leading cloud the user takes time. Typically, one cannot afford to wait so much on their data because it is risky. For example, consider self-driving cars, an activity performed by the machine that ought to control the user at all times. The user cannot wait till the self-driving car takes the instruction, sends it to

the cloud server, receives back the permission, and sends it back to the user because an accident will probably be done by the time. This is where edge computing takes place.



In edge computing, the computing power is placed closer to the sources of such data such as routers, IoT devices, etc. so that the data reaches one destination to the other much quicker and to even more places instead of the single route of transport that it would follow in a usual IoT device.

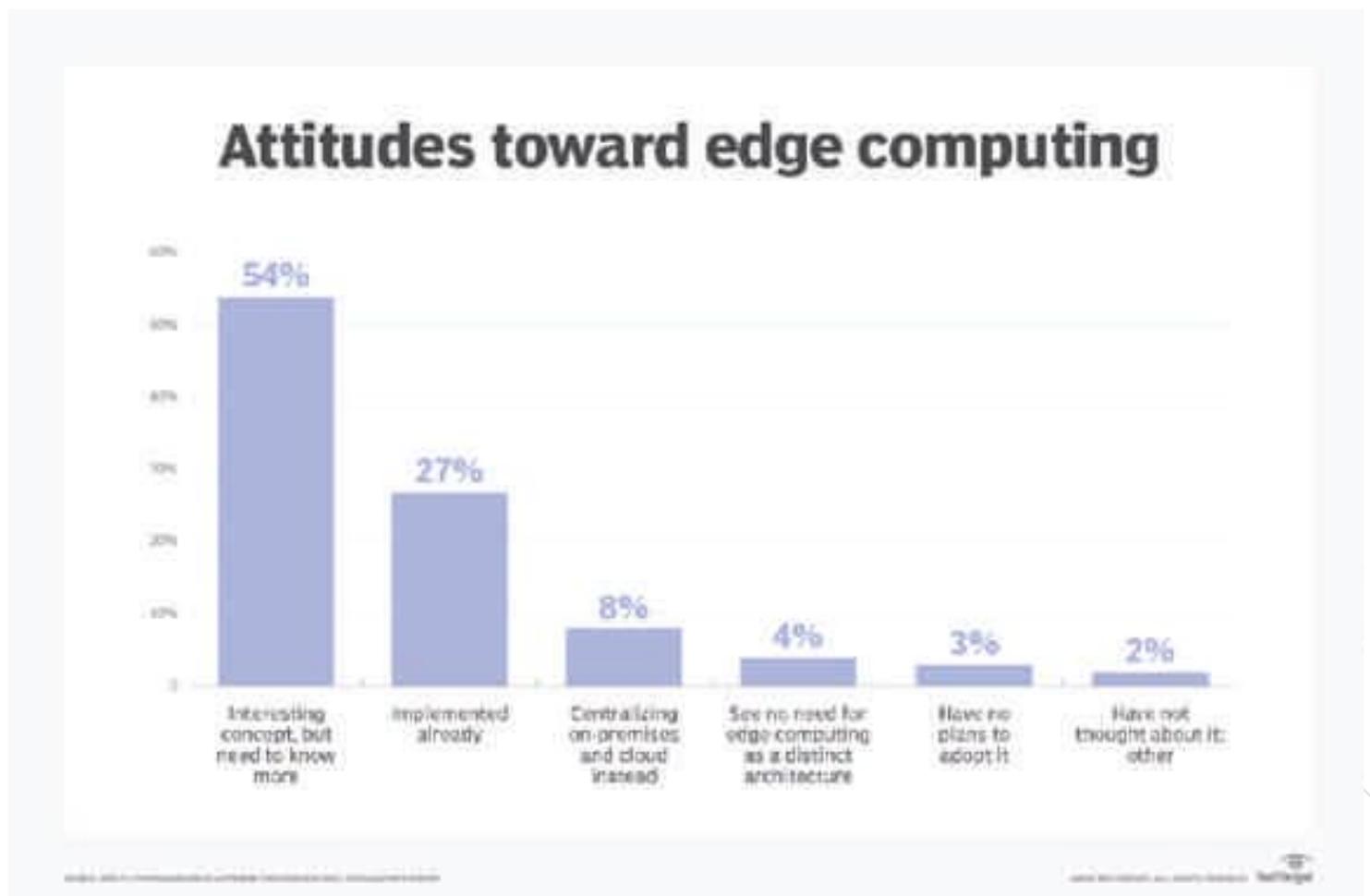
How does it save time? First, it cuts down the entire data into only the most valuable parts vital to its functioning and processing from one remote data center to another.

What are the features of edge computing?

There are various pros to edge computing such as-

1. Reduces response time
2. Filters out the trivial parts of data and delivers only valuable data
3. Conserves network resources
4. Improves time to reaction ratio and most of all
5. Enables 5G connectivity!

Different industries are approaching edge computing to vary rates, as can be seen in the bar graph.



While edge computing addresses many data and connectivity issues, it also has its own set of challenges, which we must know about, making this technology far from being foolproof.

- 1 With edge computing comes tons of security challenges since the data is summarized into smaller computing systems. Moreover, it is always on the go; there is a higher possibility of data attackers that can break into the system/chain and commit malpractices with the data, plus IoT devices can be notoriously insecure, which poses a threat to the security.
- 2 Licensing costs of edge computing prove to be one of the challenges, too, because initially, they do not coordinate with the initially low-ticket price of edge computing.
- 3 Data lifecycles are shorter since there exists completely unnecessary. However, loads of data, and when this data is not filtered out initially, edge computing tends to constantly work with loads and loads of data before sending the valuable parts of it from one destination to another. We have already read about how IoT devices are not too secure, posing a threat to the entire data altogether.
- 4 Physical maintenance can never be overlooked since this is the very base of this technology. We learned that IoT devices have restricted lifespans; they have to have standard battery and device replacements. Edge computing largely depends on servers and other gear, where if they fail, the entire point of this technology is being attacked/questioned. Practical site logistics must also be included with maintenance.

Overall, edge computing is slowly emerging and making its way into various corporate and business industries. It's a booming technology, and we can expect it only to get better. This technology has a handy set of features to it that help in systematic and efficient methods of data management but at the same time also poses quite heavy cons that have data on the line, which simply cannot be tampered with. So the decision lies upon us if we want to progress towards what this technology has to offer us and make wise use of it.

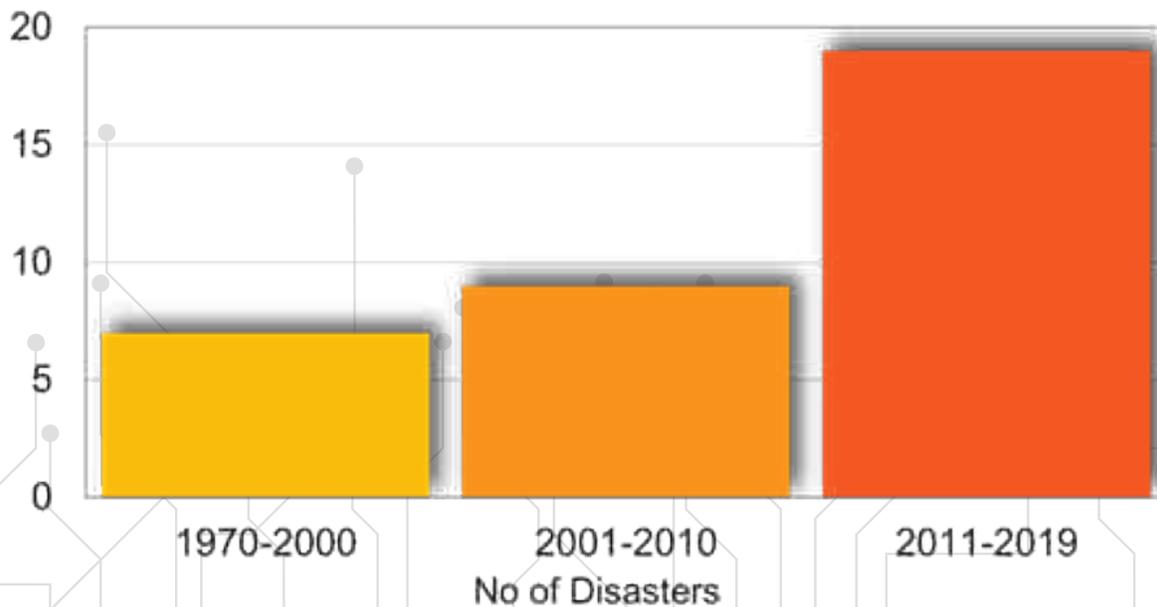
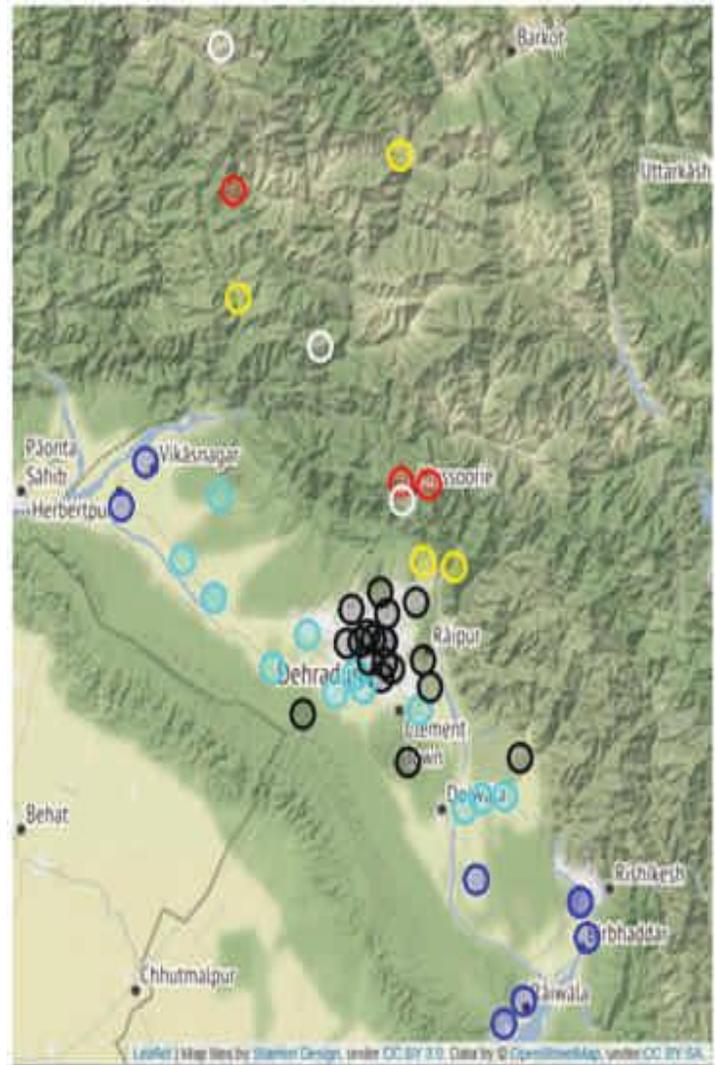


Effective Planning via Machine learning against natural disasters

By Dr. Balaji Venkateswaran

In recent years the occurrence of natural calamities has increased compared to the past due to many reasons. According to the National Disaster Management Authority (NDMA) of India, the country has faced seven significant disasters (like cyclones, earthquakes, etc.) from 1972 to 2000. However, this number has increased to nine between 2001 to 2010 and nineteen from 2011 till 2019. While Covid-19 has stalled the entire nation, the cyclone 'Amphan' has wreaked havoc in West Bengal and Odisha. Undeniably, all these can be linked to climate change. The current age governments must be prepared to handle multiple disasters concurrently. It will be the new normal going forward. The adoption of machine learning tools can provide feasible solutions to overcome these solutions. The prospective analytics incorporates optimization and simulation algorithms to advise possible strategies to build a disaster-resilient system.

For instance, detailed research is presented in the article*, which utilizes the unsupervised machine learning tool to develop optimal clusters within the system to proactively develop strategies that will help overcome the adverse effects of natural disasters. The optimal clusters found in that region is shown below:



Save space on your laptop and in the cloud by compressing files

By Prof. Amogh Deshmukh

In this 21st century most of us store data on the cloud. The cost of storing the data on the cloud is in terms of number of bits/bytes. Digital storage always comes at a premium, so it's helpful to know how the files can be compressed into smaller packages. Reducing the amount of information within a file is known as Compression. Generally, we can split the file compression into two main types: lossless and lossy. Removing unnecessary bits/bytes of information reduces the file size. This type of compression is known as Lossy compression. In media files such as video, image and different audio formats,



the final representation of the data may not be required to be the same as the source representation. MP3 and JPEG are the most common formats which use lossy compression. An example of an audio file where the complete information about the original audio is not represented is MP3 file. Instead, in an MP3 file, some of the unwanted sounds which humans can't hear is removed. Similarly, in JPEG images non-critical parts of the image are removed. For instance, when we consider a picture with a blue sky, the compression of the JPEG image that takes place is such that only one or two shades are blue, instead of considering dozens of different shades in the image. Lossy compression is not suitable for files where all the information is critical or in other words files originality needs to be maintained.



Fig 1: The images show the reduced sharpness when compared to an original image using lossy technique

When we perfectly reconstruct from an original file by reducing the file size without causing any loss of information is called as Lossless Compression. Essentially, lossless compression removes redundant information which is not required. Contrary to lossy compression, it doesn't remove unwanted information from the file which is subjected to compression. The lossless compression algorithms basic principle is easy to grasp. Imagine a file made of 6 M's in a row, which would look like this: "MMMMMM". You could compress that to take up less space by replacing those six characters with something like "6M". Formats such as MP3 and JPEG used lossless compression by default.

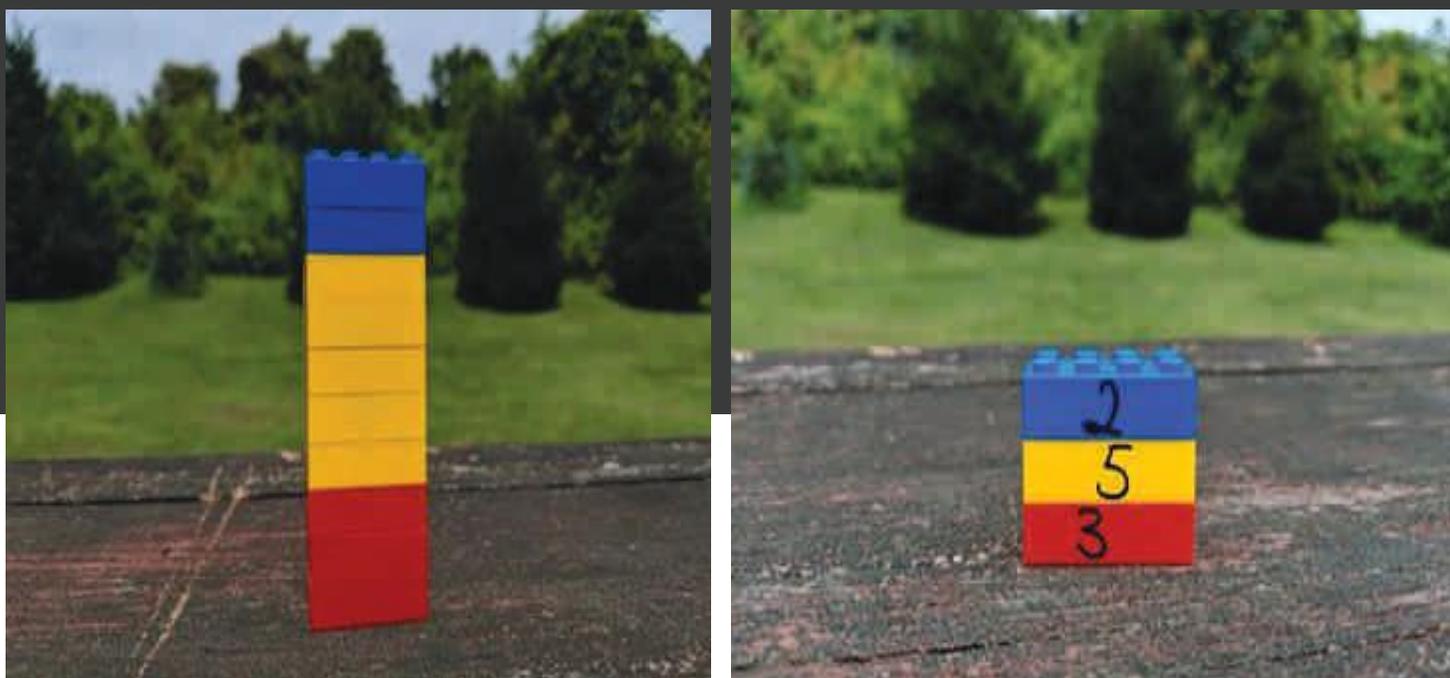


Fig 2: Images show how the number of blocks can be reduced by assigning a number to each colored block using lossless technique

Generally, you should use lossy compression if you are okay with some information loss, which may not be exactly the same as the source file and lossless compression when you require a perfect reconstruction from the original file without any compromise on information loss. For Windows there is software called 7-Zip which is free and can be used for compressing different file formats and PeaZip is another free software which supports many different file formats for compression.

How Google Search Works

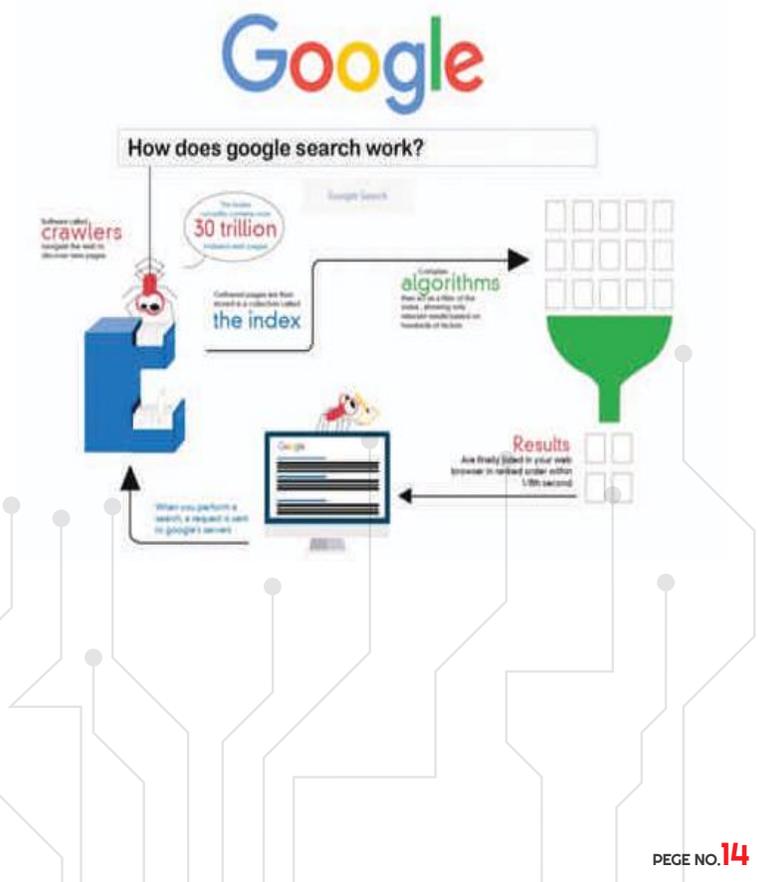
By Kinshuk Sunder Reddy

What is an algorithm?

Every day billions of individuals come up with questions on all types of things. Sometimes google even get questions about google search itself, like how this unit works, and while this is often a subject, entire books are written. Say you're within the marketplace for something or a bit more concise, so let's say it's getting near dinner and you would like a recipe for lasagne you've probably seen this before but let's go a bit deeper since the start back when the homepage looked different than what it's now Google has been continuously mapping the internet with billions of pages to make something called an index. Let's consider it because of the giant library we glance through; whenever you are researching lasagne or the rest now, the word lasagne shows up plenty on the web pages about the history of lasagne articles by scientists whose cognomen happened to be lasagne or stuff others can be trying to find, but if you're hungry randomly clicking through millions of links isn't any fun, this is often where Google's ranking algorithms acquire play. First, they fight to understand what you're searching for so that they may be helpful whether or not you don't know precisely the right words to use or if your spelling may be a little off then they shift through countless possible matches in the index and automatically assemble a page that tries to place the foremost relevant information up top for you to settle on from them. Now we've got some results, but how did the algorithms decide what made it into the primary page.

There are many factors that enter ranking search results, so let's discuss some of them. You will already know that pages containing the words you seek are more likely to finish up at the highest no surprise there, but the placement of these words like within the page's title or in images caption those factors. There is a lot more to ranking than simply words. When Google got started, they checked out how pages linked to

every other to better understand what pages were about and how important and trustworthy they seemed. Today, linking continues to be a crucial factor; another factor is location, where a hunt happens. Because if you happen to be in Italy, you may be searching for information about their annual lasagne festival, but if you're in Omaha, Nebraska, you most likely aren't. When a webpage was uploaded is an essential factor too. Pages published more recently often have more accurate information, especially within the case of a rapidly developing article. Not every site on the net is trying to be helpful, similar to robocalls on your phone or spam in your email; many websites only exist scam, and everyday scammers upload millions more of them. Google spends lots of your time trying to remain one step before tricks like these, ensuring their algorithms can recognize scam sites and flag them before they create them to search results page.



Billions of times each day, whenever someone searches for a recipe or resume writing tips or a way to swaddle a baby or anything else, google software locates all the possibly relevant results the online removes all the spam and ranks them supported many factors like keywords, links, location, and freshness. This last part is about how google makes changes to search, and it is vital. Since 1998 when Google went online, people seem to possess found the results pretty helpful. But the net is often changing, and other people are constantly attempting to see new things. One in every seven searches is for something that's never been typed into the search box before by anyone ever. So google is usually acting on updates to look thousands each year. Now arises a big question how do google decide whether a change is making search more help-

ful? One in all the ways they evaluate potential updates to look is by asking people like us. Every day thousands of search quality ratters observe samples of search results side by side then give feedback about the relevance and reliability of the knowledge. To make sure those evaluations are consistent, the ratters follow a listing of search quality evaluator guidelines. Think of them as our publicly available guide to what makes a decent result suitable. Google uses responses from readers to judge changes. But they do not directly impact how search results are ranked. Every time you click to search, the algorithms are analysing the meaning of the words in your quest, matching them to the content on the web, understanding what content is presumably to be helpful and reliable, and so automatically putting it all together in a very neatly organized page designed to urge you the information you wish tired just a fraction of seconds.

How Google Search Works



Role of AI in Renewable Energy

By Dr. Balaji Venkateswaran



In recent years, it is widely acknowledged that fossil fuels are not the future energy resource for our energy needs. Renewable energy is emerging as the most promising alternative for our future; however, there are various challenges in integrating renewable energy with our energy demand. Among the renewables, solar and wind are the most popular resources. Even though these resources are abundant, it is entirely uncertain. In other words, since these resources are highly dependent on weather, it is highly unpredictable, and we are still in the early stages for the smooth transition from generation to power consumption.

One of the better ways to tackle these resources is demand-side management. The demand-side management is a clever way to manage the demand as per the power generation from renewables as the renewable generation varies concerning time. This concept might sound very easy; however, the problem comes during the implementation stage. Deployment of Artificial Intelligence and machine learning tools on the data collected from sensors at various demand levels (like using smart meters) can greatly improve the understanding level of a particular demand, which might help develop specific controllers to satisfy the desired demand-side management. Besides, with the help of an AI-based approach, effective decentralization of power generation and demand satisfaction could be achieved.

SPACE - TECH

TECH BUZZ | **TELESCOPE** | SPACE ROBOTICS

By Adithya Havaladar

Space technology

We nowadays stumble upon various types of technology applications in multiple fields of science like physics, biology, chemistry, and more. One of the main challenging areas is astrophysics. The technology used for a better understanding of the universe is termed space technology. Space technology has vast technological applications such as robotics, image processing, data analysis, optical lensing, and many more. Using these technologies, we will understand laws of physics beyond Earth's atmosphere and not only derive new theoretical equations but also explore space and travel into space. Space technology is among the foremost advanced and sophisticated technology applications, which incorporates spacecraft, satellite, orbiter, orbital launch vehicles, part communication, and broad forms of technologies used for interstellar exploration.

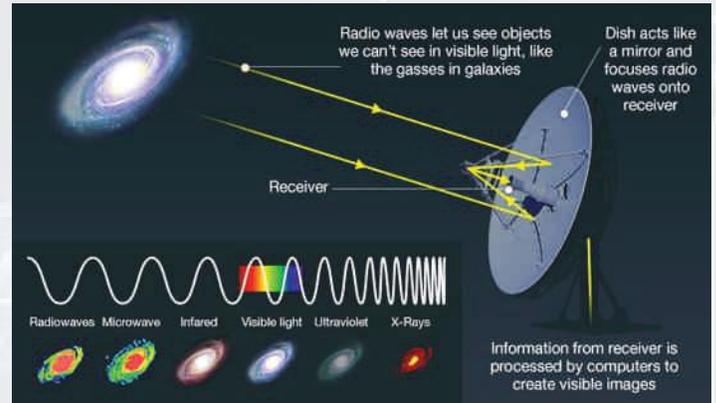


Telescope technology

Telescopes collect light and other types of energy from stars and galaxies. The energy travels in wavelengths, but Earth's atmosphere stops many of these from reaching our planet's surface. So telescopes located in space (satellites) are ready to collect the complete range of wavelengths and provide a full view of the universe.

Radio telescope: A radio reflector could be a specialized antenna and tuner accustomed to detect radio waves from astronomical radio

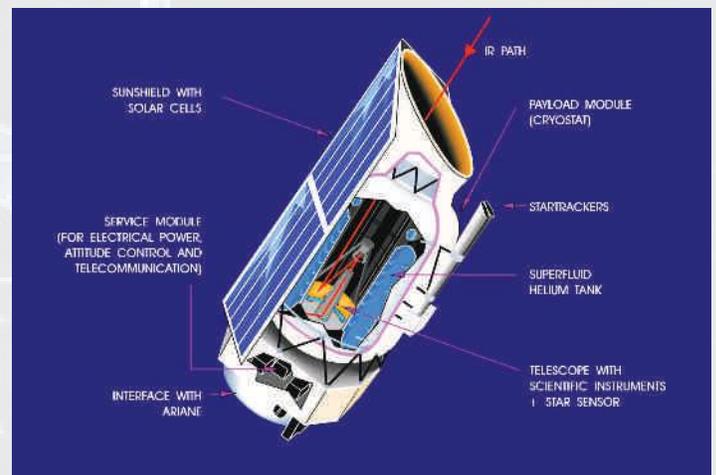
sources within the sky. **Optical telescope:** A telescope that assembles and shines light principally from the visible part of the spectrum to make an amplified picture for direct visual inspection, create a photo, or gather data through image sensors.



Ultraviolet - Telescope

telescope accustomed to examine the ultraviolet portion of the spectrum, between the part seen as light and the other portion occupied by X-rays.

Infrared telescope: Telescope that uses actinic radiation to detect celestial bodies. Infrared radiation is one in all several sorts of radiation present within the spectrum. For example, all celestial objects with a temperature above temperature emit radiation.



Space robotics

A robotic spacecraft is an unscrewed space apparatus, generally under telerobotic control. An automated shuttle designed to form research measurements is usually called a space probe.



STRUCTURE

This is often the actual spine structure. It:

- Gives by and sizeable mechanical uprightness of the space apparatus.
- Guarantees space apparatus parts are upheld and might withstand dispatch loads.

DATA HANDLING

This is once in a while noticed because of the order and information of the subsystem. It usually's answerable for:

- Order succession stockpiling
- Keeping up with the space apparatus clock
- Gathering and revealing rocket telemetry information (for example, space apparatus wellbeing)
- Gathering and disclosing mission information (for example, photographic pictures)

ELECTRICAL POWER

The stockpile of electric power on a rocket(spacecraft) commonly comes from photovoltaic (solar) cells or a radioisotope thermoelectric generator. Different segments of the subsystem incorporate batteries for putting away force and dispersion hardware that associates segments to the power sources.

TELECOMMUNICATION

Telecommunication includes radio antennas, transmitters, and receivers as components in the subsystem. Using these components, one can communicate with ground stations on Earth or with other spacecraft.

Curiosity is the essence of our existence.
-Gene Cernan