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Cyber Security

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Abstract : Cyber security is a necessary consideration for information technology as well as Internet services. Whenever we think about the cyber security we think of 'cybercrime' which is

increasing day by day. Various governments and companies are talking many measures to prevent the cybercrime. . It refers to the body of technologies, processes, and it may also be referred to as information technology security. The field is of growing importance due to increasing reliance on computer systems, including smart phones, televisions and the various tiny devices that constitute the Internet of Things.

Keywords: IT security, Internet of things (IOT).

> ## INTRODUCTION

Cyber security is primarily about people, processes, and technologies working together to encompass the full range of threat reduction, vulnerability reduction, deterrence, international engagement, incident response, resiliency, and recovery policies and activities, including computer network operations, information assurance, law enforcement, etc. Cyber security is the protection of Internet-connected systems, including hardware, software, and data from cyber attacks. It is made up of two words one is cyber and other is security. Cyber is related to the technology which contains systems, network and programs or data. Whereas security related to the protection which includes systems security, network security and application and information security. It is the body of technologies, processes, and practices designed to protect networks, devices, programs, and data from attack, theft, damage, modification or unauthorized access. It may also be referred to as information technology security.

> ## What is Cyber Security ?

Cybersecurity is the practice of protecting systems, networks, and programs from digital attacks. These **cyberattacks** are usually aimed at accessing, changing, or destroying sensitive information; extorting money from users; or interrupting normal business processes.Implementing effective cybersecurity measures is particularly challenging today because there are more devices than people, and attackers are becoming more innovative.

> ## WHY DO WE NEED CYBER SECURITY ?

The range of operations of cyber security involvesprotecting information and systems from major cyberthreats. These threats take many forms. As a result, keeping pace with cyber security strategy and operations can be a challenge, particularly in government and enterprise networks where, in their most innovative form, cyber threats often take aim at secret, political and military assets of a nation, or its people. Some of the common threats are :[1]

- **Cyber terrorism**
  Cyberterrorism can be also defined as the intentional use of computers, networks, and public internet to cause destruction and harm for personal objectives. Experienced cyberterrorists, who are very skilled in terms of hacking can cause massive damage to government systems, hospital records, and national security programs, which might leave a country, community or organization in turmoil and in fear of further attacks. The objectives of such terrorists may be political or ideological since this can be considered a form of terror.

- **Cyber warfare**
  Cyber warfare involves the actions by a nation-state or international organization to attack and attempt to damage another nation's computers or information networks through, for example, computer viruses or denial-of-service attacks.

- **Cyber spying**
  Cyber spying is the act or practice of obtaining secrets and information without the permission and knowledge of the holder of the information from individuals, competitors, rivals, groups, governments and enemies for personal, economic, political or military advantage using methods on the Internet, networks or individual computers through the use of proxy servers.[3]

➢ **Who are Cyber Criminals ?**

Cyber criminals, also known as hackers, often use computer systems to gain access to business trade secrets and personal information for malicious and exploitive purposes. Hackers are extremely difficult to identify on both an individual and group level due to their various security measures, such as proxies and anonymity networks, which distort and protect their identity. Cybersecurity experts assert that cyber criminals are using more ruthless methods to achieve their objectives and the proficiency of attacks is expected to advance as they continue to develop new methods for cyber attacks. The growth of the global cyber criminal network, which is largely credited to the increased opportunity for financial incentives, has created a number of different types of cyber criminals, many of which pose a major threat to governments and corporations.

- **Identity Thieves**

Identity thieves are cyber criminals who try to gain access to their victims' personal information – name, address, phone number, place of employment, bank account, credit card information and social security number. They use this information to make financial transactions while impersonating their victims. Identity theft is one of the oldest cyber crimes, gaining prominence during the early years of the Internet. Initially, these cyber criminals leveraged basic hacking techniques, such as modifying data and leveraging basic identity fraud to uncover the desired information. Today, the practice has progressed in scope and technique due to advances in computing, and now, many identity thieves can hack into a government or corporate database to steal a high-volume of identities and personal information. This expansion of strategy has resulted in major losses for companies and consumers, with recent studies indicating that approximately $112 billion has been stolen by identity thieves over the past six years.

- **Internet Stalkers**

Internet stalkers are individuals who maliciously monitor the online activity of their victims to terrorize and/or acquire

personal information. This form of cyber crime is conducted through the use of social networking platforms and malware, which are able to track an individual's computer activity with very little detection. The motives for such attacks can differ depending on the cyber criminal, but many internet stalkers seek to acquire important information that they can use for bribery, slander, or both. Businesses should be aware of internet stalkers, as well as the strategies that they utilize, in case their employees are ever victims of this cyber attack. If left unaddressed, internet stalkers could cause emotional distress to the team or even obtain data for blackmail.

- **Phishing Scammers**

Phishers are cyber criminals who attempt to get ahold of personal or sensitive information through victims' computers. This is often done via phishing websites that are designed to copycat small-business, corporate or government websites. Unsuspecting computer users often fall prey to such activities by unknowingly providing personal information including home addresses, social security numbers, and even bank passwords. Once such information is obtained, phishers either use the information themselves for identity fraud scams or sell it in the dark web. It's important for businesses to constantly be aware of phishing scams, particularly scams that may be trying to copycat their own business site. Such sites can tarnish the company's reputation and brand, which could potentially lead to a decrease in earnings.

- **Cyber Terrorists**

Cyber terrorism is a well-developed, politically inspired cyber attack in which the cyber criminal attempts to steal data and/or corrupt corporate or government computer systems and networks, resulting in harm to countries, businesses, organizations, and even individuals. The key difference between an act of cyberterrorism and a regular cyber attack is that within an act of cyber terrorism, hackers are politically motivated, as opposed to just seeking financial gain.[3]

➢ **How To Maintain Effective Cyber Security**

Historically, organizations and governments have taken a reactive, "point product" approach to combating cyber threats, produce something together individual security technologies – one on top of another to safe their networks and the valuable data within them. Not only is this method expensive and complex, but news of damaging cyber breaches continues to dominate headlines, rendering this method ineffective. In fact, given the area of group of people of data breaches, the topic of cyber security has launched to the top of the priority list for boards of directors, which they seeked as far as less risky way. Instead, organizations can consider a natively integrated, automated Next-Generation Security Platform that is specifically designed to provide consistent, prevention-based protection – on the endpoint, in the data centre, on the network, in public and private clouds, and across Saabs environments. By focusing on prevention, organizations can prevent cyber threats from impacting the network in the first place, and less overall cyber security risk to a manageable degree. [1]

➢ **What Cyber Security Can Prevent**

cyber security can help prevent cyber-attacks, data breaches and identity theft and can aid in risk management.When an organization has a strong sense of network security and an effective incident response

plan, it is better able to prevent and serious of these attacks.[1].

➢ **Types of Cyber Security Threats**

new technologies, security trends and threat intelligence is a challenging their task. However, it should be in order to protect information and other assets from cyber threats, which take many forms.

• **Social Engineered Trojans**

Social engineering, in the context of information security, is the psychological manipulation of people into performing actions or divulging confidential information. This differs from social engineering within the social sciences, which does not concern the divulging of confidential information.

• **Unpatched Software**

Unpatched software refers to computer code with known security weaknesses. Once the vulnerabilities come to light, software vendors write additions to the code known as "patches" to cover up the security "holes." Running unpatched software is a risky activity because by the time a patch emerges, the criminal underground is typically well-aware of the vulnerabilities.

• **Phishing**
Phishing is a cybercrime in which a target or targets are contacted by email, telephone or text message by someone posing as a legitimate institution to lure individuals into providing sensitive data such as personally identifiable information, banking and credit card details, and passwords.

• Network traveling worms

Network travelling worms are computer programs that can harm and damage computer networks once they gain access to them.

• **Malware**
Malware, or malicious software, is any program or file that is harmful to a computer user. Types of malware can include computer viruses, worms, Trojan horses and spyware. These malicious programs can perform a variety of different functions such as stealing, encrypting or deleting sensitive data, altering or hijacking core computing functions and monitoring users' computer activity without their permission.

➢ **What does a security analyst do ?**

An information security analysts protects to safe the company's systems and networks by planning and carrying out measures of security. They create disruptive solutions to prevent critical information from being stolen, damaged, or compromised. Their primary responsibility is to keep a business or organizations data, clients, employees, and any virtual stored information safe from cyber attacks or hacking of anysort.[1]

➢ **What are the consequences of cyber attack ?**
Cyber attacks can cause electrical blackouts, failure of military equipment and breaches of national security secrets. They can result in the theft of valuable, sensitive data like medical records. They can disrupt phone and computer networks or paralyze systems, making data unavailable.

➢ **THE LEVEL OF CYBER RISK**
As combating cyber-threats has become a highly politicized issue, official statements about the level of threat must also be seen in the context of different bureaucratic entities that compete against each other for resources and influence. , psychological research has shown that risk perception is highly dependent on intuition and emotions, as well as the perceptions of

experts (Gregory and Mendelsohn 1993). Cyber-risks, especially in their more extreme form, fit the risk profile of so-called „dread risks", which appear uncontrollable, catastrophic, fatal, and unknown[1].

➢ **REDUCING CYBER – IN - SECURITY**

Common Cyber Attacks: Reducing The Impact helps organisations understand what a common cyber attack looks like and explains why all organisations should establish basic security controls and processes, to protect themselves from such attacks.It can be read alongside the recently updated 10 Steps to Cyber Security, which offers more comprehensive guidance on the practical steps organisations can take to improve the security of their networks and the information carried on them The paper does not provide a comprehensive review of sophisticated or persistent attacks, nor a detailed analysis of how those attacks occurred.

Common cyber attacks at-a-glance

The downloadable info graphic below summarises the security controls you can apply to reduce your organisation's exposure to a successful cyber attack.

NCSC Cyber Attacks Infographic
The threat landscape

Before investing in defences, many organisations often want concrete evidence that they are, or will be targeted, by specific threats. Unfortunately, in cyberspace it is often difficult to provide an accurate assessment of the threats that specific organisations face.However, every organisation is a potential victim. All organisations have something of value that

is worth something to others. If you openly demonstrate weaknesses in your approach to cyber security by failing to do the basics, you will experience some form of cyber attack.

Reducing your exposure to cyber attack

Fortunately, there are effective and affordable ways to reduce your organisation's exposure to the more common types of cyber attack on systems that are exposed to the Internet. The following controls are contained in the Cyber Essentials, together with more information about how to implement them:

o boundary firewalls and internet gateways - establish network perimeter defences, particularly web proxy, web filtering, content checking, and firewall policies to detect and block executable downloads, block access to known malicious domains and prevent users' computers from communicating directly with the Internet

o malware protection - establish and maintain malware defences to detect and respond to known attack code

o patch management - patch known vulnerabilities with the latest version of the software, to prevent attacks which exploit software bugs

o whitelisting and execution control - prevent unknown software from being able to run or install itself, including AutoRun on USB and CD drives

o secure configuration - restrict the functionality of every device, operating system and application to the minimum needed for business to function

o password policy - ensure that an appropriate password policy is in place and followed

- o user access control - include limiting normal users' execution permissions and enforcing the principle of least privilege

If your organisation is likely to be targeted by a more technically capable attacker, give yourself greater confidence by putting in place these additional controls set out in the 10 Steps to Cyber Security:

- o security monitoring - to identify any unexpected or suspicious activity

- o user training education and awareness - staff should understand their role in keeping your organisation secure and report any unusual activity

- o security incident management - put plans in place to deal with an attack as an effective response will reduce the impact on your business

Raising your cyber defences

The Internet can be a hostile environment. The threat of attack is ever present as new vulnerabilities are released and commodity tools are produced to exploit them. Doing nothing is no longer an option. Protect your organisation and your reputation by establishing some basic cyber defences to ensure that your name is not added to the growing list of victims.

CONCLUSION

More highly skilled workers in cybersecurity roles would help the nation respond more robustly to the cybersecurity problems it faces. All organizations need to understand their threat environment and the risks they face, address their cybersecurity problems, and hire the most appropriate people to do that work.

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MIND READING MACHINE IS CO-ORDINATION OF HUMAN PSYCHOLOGY AND COMPUTER TECHNIQUES

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Mind Reading Machine is Co-ordination of Human Psychology and Computer Techniques

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Abstract

People express their mental status, including emotions, thoughts and desires, all the time   through facial expressions, vocal nuances and gestures. Mind reading machine is co-ordination of human psychology and computer techniques. Some equipment are used to gather data &then analysed. To use those data for further predication of mind is known as theory of mind reading. Existing Human-computer interface are mind –blind, they are unaware to the user's mental states and intention. Drawing Inspiration from psychology, computer vision and machine learning, the team in the Computer Laboratory at the University of Cambridge has developed mind reading machines-computer. That implement a computational model of mind reading to inter mental states of people from their facial signals. The goals to enhance human-computer interaction through empathic responses, to improve the productivity of the user and to enable application to initiate interactions with andon behalf of the user, without waiting for explicit input from that user. There are difficult challenges: Using A digital video camera, the mind-reading computer system analyses a person's facial expressions in real time infers that person's underlying mental state, such as whether he or she is disagreeing, interested or bored, thinking or confused.

Key words: Introduction, what is Mind Reading, flow chart of mind reading, process of mind reading, Techniques, Advantage and Disadvantage of mind reading.

> ## Introduction

      People express their mental states, including emotions, thoughts, and desires, all the time through facial expressions, vocal nuances and gestures. This is true even when they are interacting with machines. Our mental states shape the decisions that we make, govern how we communicate with others, and affect our performance. The ability to attribute mental states to others from their behavior and to use that knowledge to guide our own actions and predict those of others is known as theory of mind or mind-reading.[1] Mind reading computer may be defined as a machine that infers the human being's mental states. The understanding of a human's thoughts is one of the most complex tasks. No one knows what a person would do in the upcoming second by executing his present thoughts or what would a person thought about any other person or what would a person desires and many more. But a mind reading computer could give answer to all these questions[2]

> ## What is Mind Reading ?

      Mind reading computer system technology can be used for checking the mental state of a person he doesn't need to type or speak anything system will understand this by default. University of Cambridge is also working on a model of mind reading. Mind reading can be done by scanning facial expressions.[3]

    Using a digital video camera, the mind-reading computer system analyzes a person's facial expressions in real time and infers that person's underlying mental state, such as whether he or she is agreeing or disagreeing, interested or bored, thinking or confused. Prior knowledge of how particular mental states are expressed in the face is combined with analysis of facial expressions and head gestures occurring in real time. The model represents these at different granularities, starting with face and head movements and building those in time and in space to form a clearer model of what mental state is being represented. Software from Nevenvision identifies 24 feature points on the face and tracks them in real time. Movement, shape and colour are then analyzed to identify gestures like a smile or eyebrows being raised. Combinations of these occurring over time indicate mental states. For example, a combination of a head

nod, with a smile and eyebrows raised might mean interest. The relationship between observable head and facial displays and the corresponding hidden mental states over time is modeled using Dynamic Bayesian Networks. [2].

> **Why Mind Reading ?**

       Imagine a future where we are surrounded with mobile phones, cars and online services that can read our minds and react to our moods. How would that change our use of technology and our lives? Mind-reading can also support on-line shopping and learning systems. There are many uses of minreading (See table 1)[4].

Table 1 . Different working areas of mindreading

WORKING AREAS	USES
MILITARY AREAS	A science fiction fantasy – the "Thought Police" – where the government reads people's memories and thoughts and then rehabilitate them through torture before they ever even commit a crime based on a statistical computer.
MEDICAL AREAS	1. Mind-Reading Computer Gives Voice, Movement to the Paralyzed: New technology may help those who are locked inside their own bodies (like in lockedin-syndrome). 2. Mind reader computer can communicate with the patients in coma: Canadian researchers have developed an interesting Computer which can read mind and could be helpful to communicate with the people who are in coma. This can be called a Computer Mind reader.
GADGETS	Mindreading technique can also used in mobile phones, cars, keyboards and mouse etc.

> **How Does it works**
>> • Futuristic Head Band

       The system of it contains a head band that is repeated by send light emission to the tissues of the head where it is active. The band first measures the oxygen and then measures the blood around the people's brain which uses a technology called as Functional NearInfrared Spectroscopy(FNIRS). The user who uses this mind has a Futuristic Head Band.[5]

> **Flow Chart of Mind Reading Computers**

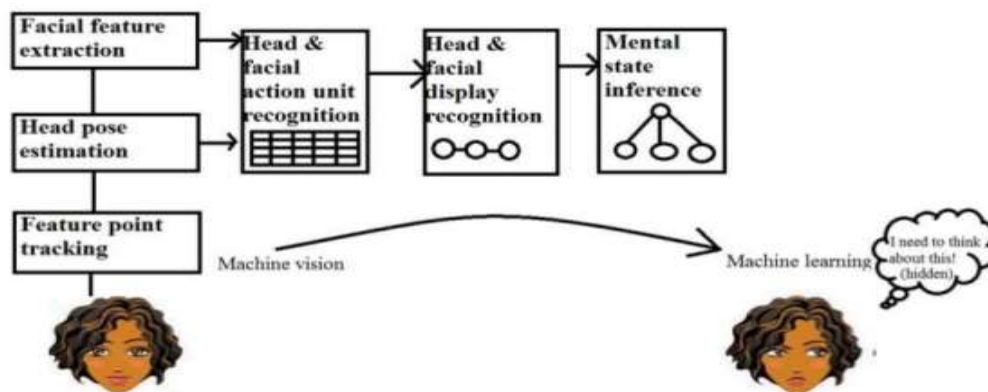## FLOW CHART OF MIND READING COMPUTER

Figure : 2

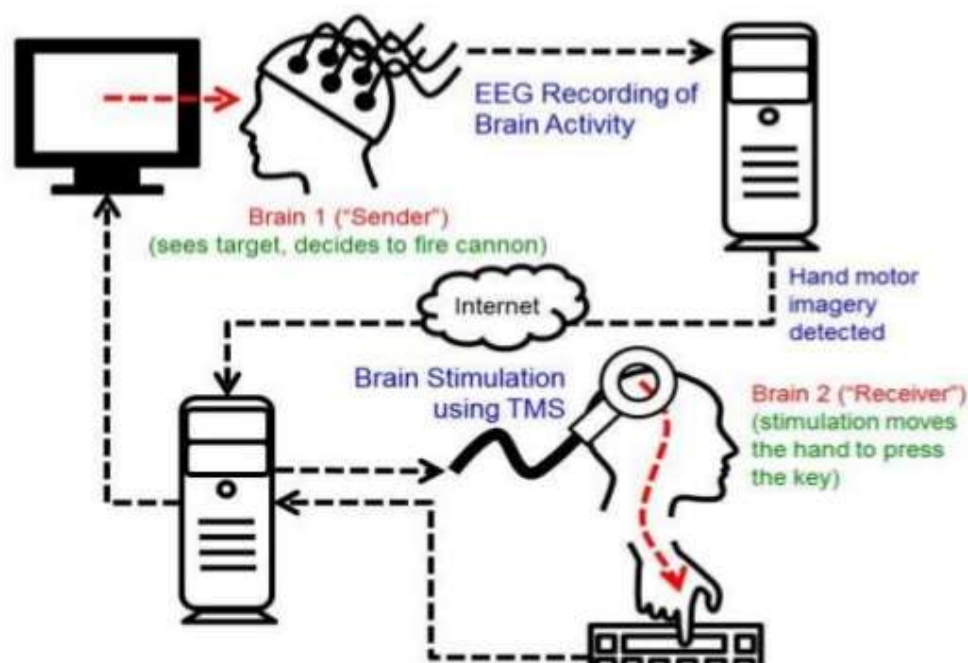➢ **Process of Mind Reading Computer**

Figure : 3

➢ **Web Serach**

For the first test of the sensors, scientists trained the software program to recognize six words - including "go", "left" and "right" - and 10 numberParticipants hooked up to the sensors silently said the words to themselves and the software correctly picked up the signals 92 per cent of the time. Then researchers put the letters of the alphabet into a matrix with each column and row labeled with a single-digit number. In that way, each letter was represented by a unique pair of number co-ordinates. These were used to silently spell "NASA" into a web search engine using the program. "This proved we could browse the web without touching a keyboard". [1]

➢ **Techniques**

         ➢ Facial Effect Detection :

It is done using hidden Markov Model,Neural Network processing or active appearance model.

         ➢ Emotional Classification :

Classification by Paul Ekman Anger, Fear, Happiness, Disgust, Sadness, Surprise

         ➢ Facial Electromyography :

It is used to measure electrical activities of Facial Muscles. The muscles used are "Corruguator Supercilli Muscles".[5]

➢ **Applications**

- *Applications of "mind-reading" technology*

    Overview, previous approaches, limitations – deCharms (2008) discusses how real-time brain imaging (e.g., with fMRI) allows access to both subjective experience (to an extent) and to objective observations and quantitative measurements of brain activity. He outlines some past approaches to "mind-reading" as well as limitations to current approaches. This leads to a discussion of the applications of current neuroimaging research:

- *Lie detection*

    a) Langleben (2008) argues that blood oxygenation level-dependent (BOLD) fMRI could be sensitive to differences between lies and truth. The key, he claims, is that BOLD fMRI can only *compare* states rather than positively identify deception. He discusses how many popular science articles conflate how much fMRI can do.

    b) Mertens & Allen (2008) discuss whether ERP-based procedures could detect deception, instead of or in addition to fMRI.

    c) Moreno (2009) discuss ethical issues in lie detection and how the   law should be influenced by cognitive neuroscience, specifically in cases where neuroimaging could be used to determine truth, lies, and guilt.

- *Pain detection*

    a) Marquand et al. (2010) suggest that supervised machine learning algorithms can be used to decode fMRI data. They use this kind of technique to show that fMRI can be used to predict participants' subjective pain ratings and propose that it will be a useful method for producing qualitative predictions about brain states.

- *Brain-computer interfaces*

    a) Direct brain communication in paralysis, motor restoration in stroke – Birbaumer & Cohen (2007) evaluate the use of EEG and fMRI in brain-computer interfaces, focusing on applications for paralyzed patients and for motor restoration in the case of stroke. Although currently, our understanding of the information flow in the brain that is required for such interfaces to work is incomplete, such interfaces will eventually be able to be used for direct brain communication and will allow otherwise "locked-in" patients to interact with the world.

    b) Daly & Wolpaw (2008) also discuss advances in the analysis of brain signals and training patients to control those signals, focusing on EEG techniques specifically for patients with severe motor disabilities.

- *Pattern analysis and future research*

    a) Norman et al. (2006) argue that fMRI data can be used in conjunction with sophisticated pattern-classification algorithms to decode the exact information represented in a patient's brain at a particular moment in time. They discuss factors that would boost the performance of this method — it is possibly the most promising research toward actual mind-reading.

> **Advantage and Disadvantage of Mind Reading Computer**

a) Advantages of Mind Reading

The use of mind reading has many advantages and some of it is as follows:
- It can be implemented on the wheelchair and the wheelchair can be moved through the mind control. It permits the people who cannot use the normal wheelchairs and other wheelchairs easily due to their disability.
- This will aid the spacewalking astronauts and physically disabled persons.
- This type of system can send instructions to the rover on the other planets and also aid injured astronauts to control devices.
- This can be availed to exchange information on sly, people can avail them on crowded buses without the problem of being overheard

b) Disadvantages of Mind Reading

Along with the wide range of applications and advantages, the mind reading has some of the disadvantages and they are as follows:
- Before implementing the systems the scientist needs to train the systems about all the patterns to predict the result.
- Because of this scientific development, the scholars are questioning on the theories of criminal justice of the system.

> **Conclusion**

Mindreading is the ability to infer other people's mental state and use that to make sense of and predict their behaviour. In this paper we conclude how mind reading is done using some techniques. And different working areas of mindreading computer.

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Big Data Overview

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Abstract: Big data is a new driver of the world economic and societal changes. The world's data collection is reaching a tipping point for major technological changes that can bring new ways in decision making, managing our health, cities, finance and education. While the data complexities are increasing including data's volume, variety, velocity and veracity, the real impact hinges on our ability to uncover the `value' in the data through Big Data Analytics technologies. Big Data Analytics poses a grand challenge on the design of highly scalable algorithms and systems to integrate the data and uncover large hidden values from datasets that are diverse, complex, and of a massive scale. Potential breakthroughs include new algorithms, methodologies, systems and applications in Big Data Analytics that discover useful and hidden knowledge from the Big Data efficiently and effectively.

Keywords: big data, big data characteristics, Type of big data, general challenges of big data.

1. INTRODUCTION

Imagine a world without data storage; a place where every detail about a person or organization, every transaction performed, or every aspect which can be documented is lost directly after use. Organizations would thus lose the ability to extract valuable information and knowledge, perform detailed analyses, as well as provide new opportunities and advantages. Anything ranging from customer names and addresses, to products available, to purchases made, to employees hired, etc. has become essential for day-to-day continuity. Data is the building block upon which any organization thrives.[1]. The big data era has led to the creation of a major trend towards the use of the amounts of data which is kept in the systems of big companies or on the internet and also different kinds of data produced by companies in the real world, people and other parts of the society. Thus, delay in the field of big data's research and applications not only mean the loss of industrial strategic advantage but also it is considered a weak point in the security of the virtual environment. At the moment, big data directly affects all of the aspects of modern society including business, government, healthcare, and research in any field. So, companies and organizations will improve and will be posed as a model for the analysis of services through the exploitation of potentials existing in big data [2].

2. What is Big Data?

Big data refers to the large, diverse sets of information that grow at ever-increasing rates. It encompasses the volume of information, the velocity or speed at which it is created and collected, and the variety or scope of the data points being covered. Big Data is also data but with a huge size. Big Data is a term used to describe a collection of data that is huge in volume and yet growing exponentially with time. In short such data is so large and complex that none of the traditional data management tools are able to store it or process it efficiently. In fact, the real nature and purpose of big data is the ability to use information obtained from different large amounts of the data which existed in the past heterogeneously and was always ignored [2]. But, before considering any project which deals with big data it is necessary for this big data to be organized and for the appropriate mechanisms of protection of the data to be applied from the beginning in order to avoid the drawbacks which are resulted from the data's flaw disastrous [2].

3. Characteristics of Big Data

Big data has major characteristics including big volume, variety, velocity, and veracity, value.

Figure: 1

3.1 Volume

Big data indicates a big volume of data which turn into big data through mechanisms such as human-computer interface, mobile phone internet, and brain-machine interface [2]. Volume refers to the unimaginable amounts of information generated every second from social media, cell phones, cars, credit cards, M2M sensors, images, video, and whatnot. We are currently using distributed systems, to store data in several locations and brought together by a software Framework like hadoop[8].

3.2 Variety

As Discussed before, Big Data is generated in multiple varieties. Compared to the traditional data like phone numbers and addresses, the latest trend of data is in the form of photos, videos, and audios and many more, making about 80% of the data to be completely unstructured [8]

3.3 Veracity

Veracity basically means the degree of reliability that the data has to offer. Since a major part of the data is unstructured and irrelevant, Big Data needs to find an alternate way to filter them or to translate them out as the data is crucial in business developments.[8]

3.4 Value

Value is the major issue that we need to concentrate on. It is not just the amount of data that we store or process. It is actually the amount of valuable, reliable and trustworthy data that needs to be stored, processed, analyzed to find insights.[8]

3.5 Velocity

Last but never least, Velocity plays a major role compared to the others, there is no point in investing so much to end up waiting for the data. So, the major aspect of Big Dat is to provide data on demand and at a faster pace.[8]

4.   Types of Big Data

Three different varieties

- Structured Data
- Semi-Structured Data

- Unstructured Data

4.1 Structured Data

Structured Data is used to refer to the data which is already stored in databases, in an ordered manner. It accounts for about 20% of the total existing data and is used the most in programming and computer-related activities.There are two sources of structured data-machines and humans. All the data received from sensors, weblogs, and financial systems are classified under machine-generated data. These include medical devices, GPS data, data of usage statistics captured by servers and applications and the huge amount of data that usually move through trading platforms, to name a few.Human-generated structured data mainly includes all the data a human input into a computer, such as his name and other personal details. When a person clicks a link on the internet, or even makes a move in a game, data is created- this can be used by companies to figure out their customer behavior and make the appropriate decisions and modifications.

4.2 Semi-Structured Data

The line between unstructured data and semi-structured data has always been unclear since most of the semi-structured data appear to be unstructured at a glance. Information that is not in the traditional database format as structured data, but contains some organizational properties which make it easier to process, are included in semi-structured data. For example, NoSQL documents are considered to be semi-structured, since they contain keywords that can be used to process the document easily.Big Data analysis has been found to have definite business value, as its analysis and processing can help a company achieve cost reductions and dramatic growth. So it is imperative that you do not wait too long to exploit the potential of this excellent business opportunity.

4.3 Unstructured Data

While structured data resides in the traditional row-column databases, unstructured data is the opposite-they have no clear format in storage. The rest of the data created, about 80% of the total account for unstructured big data. Most of the data a person encounters belong to this category- and until recently, there was not much to do to it except storing it or analyzing it manually.Unstructured data is also classified based on its source, into machine-generated or human-generated. Machine-generated data accounts for all the satellite images, the scientific data from various experiments and radar data captured by various facets of technology.Human-generated unstructured data is found in abundance across the internet since it includes social media data, mobile data, and website content. This means that the pictures we upload to Facebook or Instagram handle, the videos we watch on YouTube and even the text messages we send all contribute to the gigantic heap that is unstructured data.Examples of unstructured data include text, video, audio, mobile activity, social media activity, satellite imagery, surveillance imagery – the list goes on and on.

The following image will clearly help you to understand what exactly unstructured data is

The Unstructured data is further divided into –

- Captured
- User-Generated data

a. Captured data

It is the data based on the user's behavior. The best example to understand it is GPS via smartphones which help the user each and every moment and provides a real-time output.

b. User-generated data:

It is the kind of unstructured data where the user itself will put data on the internet every movement. For example, Tweets and Re-tweets, Likes, Shares, Comments, on Youtube, Facebook, etc.

5.   **General Challenges of Big Data**

Considering the mentioned key features, it is seen that big data is always facing with several challenges and among them some are created through inherent characteristics of big data in the stages of data achievement,storage, processing, transfer,and management Challenges regarding size, implementation, continuous access, veracity of the work load, security, and cost are created by current models and approaches for the analysis of big data and limitations of the current processing systems . Thus, a lot of claims regarding big data and its analysis and views point to the proverb that studying challenges of big data is like finding a needle in a hay stack [2].

CONCLUSTION
Big Data is BackBone of Devolopment of today's Cyber World.Ever Enterprise and Gigantic Compaines are Totally dependent on this technology for storing data and their analysis.

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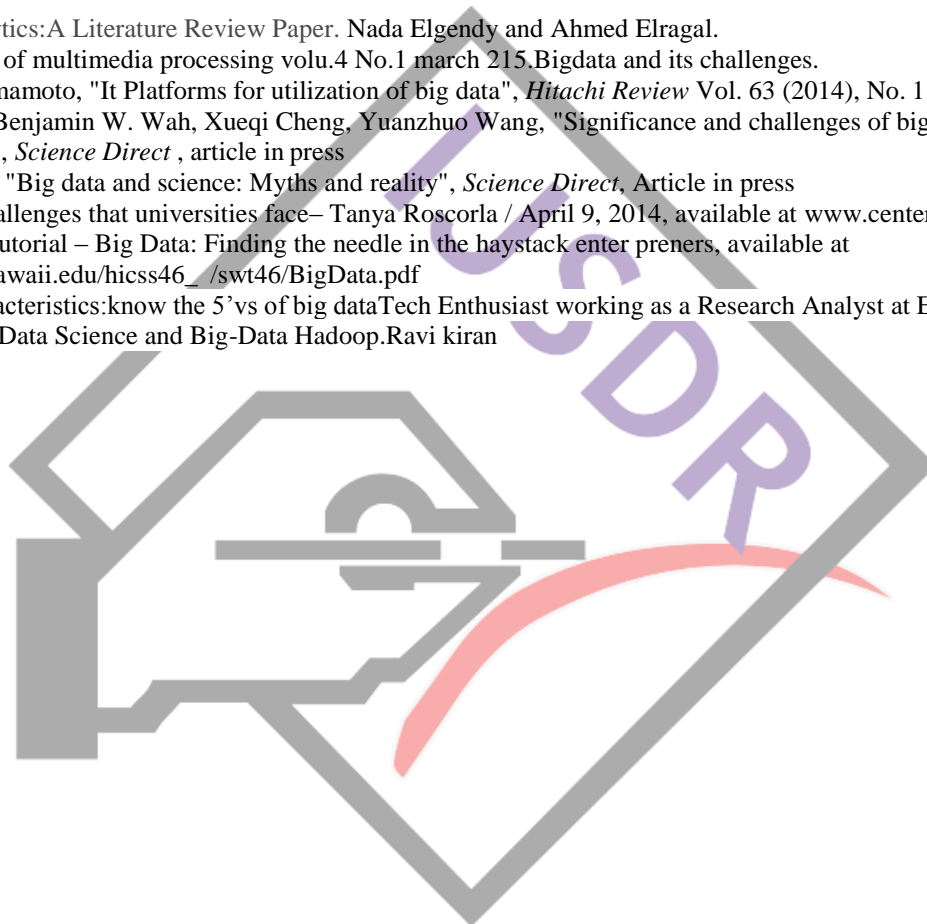
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Machine Learning in Search Engines

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Abstract - **The relevance of a web page is an innately biased matter and based on readers knowledge, interests and attitudes, web page is depended. To say justly about the relative importance of web pages, there is still much. One factor which makes it difficult for search engines to give relevant results to the users within a stipulated time is the explosive growth of internet. Classified directories are used by search engines for storing the webpages and for this process, some search engines even depend on human expertise. Automated methods are used by most of the web pages for classification of web pages. We can infer from experimental results that machine learning techniques for automated classification of the web pages proves to be the best and more relevant method for search engines.**

keywords - **for search engines. Keywords— Search Engines, expertise, machine learning, web pages, automated.**

I. INTRODUCTION

Search engines are used for searching webpages with accurate searched results in microseconds of time. Finding required information on web was unfeasible before search engines were introduced. We can say that, a search engine is a software program that searches for sites based on the words that users designate as search terms. Search Engine Optimization plays a great role in the area of internet and search engines. The successful company to launch search engine is Google which had made searching web pages in simple and precise way. Nowadays, most of the search engines use machine learning techniques for the automated classification of web pages as well as for the web page ranking. Machine learning can be applied in various fields or areas related to search engines and web page ranking.

II. RELATED WORKS

Webpage ranking algorithm, a well known approach to rank the web pages available on cyber world. It helps us to know how the search engine exactly works and how a machine learn itself while giving priority to the page that which page is important to successfully fulfills the user query need and which page is worth less. Machine Learning approach also helps us in understanding the complex part of page priority criteria in most popular search engines like Google, Yahoo, AltaVista, Dog pile and many more search engines like that. Page ranking mainly unrevealed the structure of web[1].

The world wide web has immense resources for all kind of people for their specific needs. Searching on the web using search engines such as Google, Bing, Ask have become an extremely common way of locating information. Searches are factorized by using either term or keyword sequentially or through short sentences. The challenge for the user is to come up with a set of search terms/keywords/sentence which is neither too larger nor too small to get the desired result. No matter, how the user specifies the search query, the results retrieved, organized and presented by the search engines are in terms of millions of linked pages of which many of them might not be useful to the user fully. In fact, the end user never knows that which pages are exactly matching the query and which are not, till one check the pages individually. This task is quite tedious and a kind of drudgery. This is because of lack of refinement and any meaningful classification of search result. Providing the accurate and precise result to the end users has become Holy Grail for many search engines like Google, Bing, Ask, etc. There are number of implementations arrived on web in order to provide better result to the users in the form of many search engines like Yippy, Dog pile, etc. This paper proposes development of a meta search engine called SEReleC[2] that will provide an interface for refining and classifying the search engines so as to narrow down the search results in a sequentially linked manner resulting in a huge reduction of number of pages[2].

Since the use of internet has incredibly increased, it becomes an important source of knowledge about anything for everyone. Therefore, the role of search engine as an effective approach to find information is critical for internet's users. The study of search engine users behaviour has attracted considerable research attention. These studies are helpful in developing more effective search engine and are useful in three points of view: for users at the personal level, and for government and marketing at social society level. These kinds of studies can be done through analysing the log file of search engine where in the interactions between search engine and the users are captured[3].

Meta search engine is an effective tool for searching information online. In comparison with independent search engine like Google, Bing, and etc., meta search engine has a wider coverage and can meet the requirements of information retrieval in a better manner. In particular, when a query is received from the user, the meta search engine sends it to some proper candidate member engines, collects results from them, and then replies to the user. An important issue here is how to better select the underlying member engines, collects results from them, and then replies to the user[4].

III. MACHINE LEARNING IN SEARCH ENGINES

A. Introduction to Search Engines

Search Engine[1] is a service that allows internet users to search for contents via the world wide web(www). Search engine is a software program that searches for sites based on the words that you designate as search terms. They look through their own

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databases of information inorder to find what it is that you are looking for. There are mainly three components for search engines. They are:

- web crawler
- database
- search interfaces

Web crawlers are also known as spiders or bots. It is a software component that traverses the web to gather information. All the information on the web are stored in a database. It consists of huge web resources. Search interface acts as an interface between user and the database. It helps the users to search through the database.

B Classification of Search Engines

There are many search engines on web based on the usage and features, users can use them. Every search engine has many web pages stored on their database but search engines with large number of pages on web are not top search engines. Search engines which will provide accurate information based on requested keyword will be the top search engines. Search engines are classified as follows:

- Crawler based search engines[3]
- Human powered directories
- Meta search engines[4]
- Hybrid search engines
- Speciality search engines

B.1 Crawler based Search Engines

Crawler based search engines[3] such as Google create their listings automatically. They crawl or spider the web, then people search through what they have found. If you change your webpages, crawler based search engine will find these changes and that can affect how you are listed. Three elements in crawler based search engines are:

- Crawler or spider
- index or catalog
- search engine software

Crawler or spider visits webpages and reads it and index or catalog is like a giant book containing a copy of every webpage that crawler or spider finds. If a webpage changes, then this book is updated with a new one.

B.2 Human Powered Directories

A human powered directory such as the open directory depends on humans for its listings. In this type of search engine, site owner submits a short description of the site to the directory along with category it is to be listed. Submitted site is then manually reviewed and added in the appropriate category or rejected for listing. Keywords entered in a search box will be matched with the description of the sites. This means the changes made to the content of web pages are not taken into consideration as it is only the description that matters. A good site with good content is more likely to be reviewed for free compared to a site with poor content.

B.3 Meta Search Engines

Meta search engines[4] gives results based on a combination of results from other search engine databases. It uses complex algorithms and virtual databases. A search engine that queries other search engines and then combines the results that are received from all. In effect, the user is not using just one search engine but a combination of many search engines at once to optimize web searching. For example, Dog pile is a meta search engine.
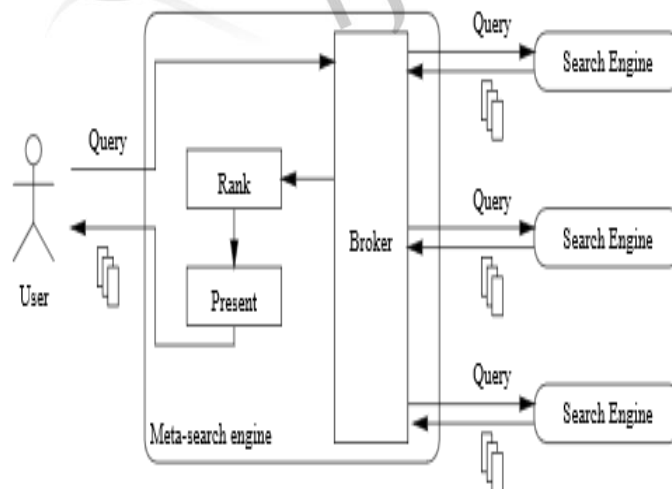

Figure B.3: Meta Search Engine

B.4 Hybrid Search Engines

Hybrid search engines present either crawler based results or human powered listings. Nowadays, it uses combination of both results. Most of the crawler based search engines like Google basically uses crawlers as a primary mechanism and human powered

directories as secondary mechanism. For example, google may take the description of a webpage from human powered directories and show in the search results. As human powered directories are disappearing, hybrid types are becoming more and more crawler based search engines. But still there are manual filtering of search result happens to remove the copied and spammy sites. When a site is being identified for spammy activities, the website owner needs to take corrective action and resubmit the site to search engines. The experts do manual review of the submitted site before including it again in the search results. In this manner though the crawlers control the processes, the control is manual to monitor and show the search results naturally.

B.5 Speciality Search Engines
Speciality search engines search a specially created database which is limited to a particular subject. A speciality search engine, sometimes called a topican or vertical search engine, searches a specially-created database limited to a particular subject. Speciality search engines fall into two main categories:

- service
- subject-specific

Speciality service search engines provide services that are often not available from larger general search engines. Subject-specific search engines search a database tailored to a particular subject. Depending on your area of interest and the type of information you are seeking, speciality search engines can provide more relevant results more quickly than a general purpose search engine such as Google or Yahoo. Speciality search engines are also an excellent source for typical research. Because of this it would be wise to also submit your blog or website to some of the speciality search engines that cater for your niche.

C Search Engine Working
While you should always create website content geared to your customers rather than search engines, it is important to understand how a search engine works. Most search engines build an index based on crawling, which is the process through which engines like Google, Yahoo and others find new pages to index. Mechanisms known as bots or spiders crawl the web looking for new pages. The bots typically start with a list of website. URL's determined from previous crawls. When they detects new links on these pages, through tags like HREF and SRC, they add theses to the list of sites to index. Then, search engine use their algorithms to provide you with a ranked list from their index of what pages you should be most interested in based on the search terms you used. Then, the engine will return a list of web results ranked using its specific algorithm. On Google, other elements like personalized and universal results may also change your page ranking. In personalized results, the search engine utilizes additional information it knows about the user to return results that are directly catered to their interests. Universal search results combine video, images and Google news to create a bigger picture result, which can mean greater competition from other websites for the same keywords.

Search engine optimization is a set of rules that can be followed by website owners to optimize their websites for search engines and thus improve their search engine ranking. In addition, it is a great way to increase the quality of your website by making it userfriendly, faster and easier to navigate. Steps in search engine optimization are as follows:

- Website analysis
- Client requirements
- Keyword research
- Content writing
- Website optimization
- SEO submission
- Link building
- Reporting

D Introduction to Machine Learning
Machine Learning is a branch of artificial intelligence(AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Some applications of machine learning are: email spam and filtering, online fraud detection, product recommendations. There are mainly three types of learning. They are as follows:

- supervised learning
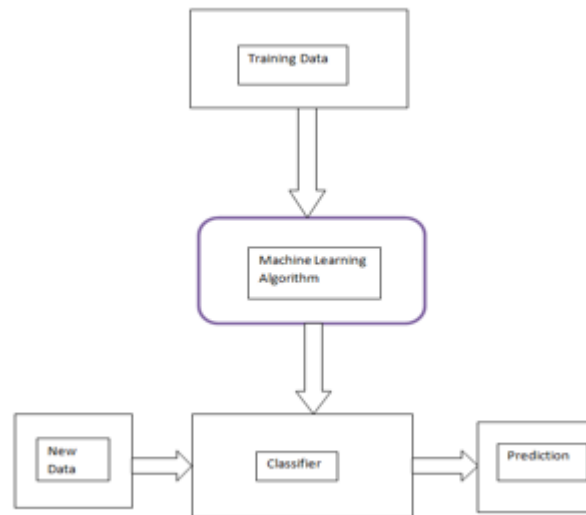- unsupervised learning
- reinforcement learning

Figure D: Machine Learning

E Applications of Machine Learning in Search Engines

Machine Learning can be applied in various areas realted to search engines. They are:

- Pattern Detection
- Identifying new signals
- Custom signals based on specific query
- Image search to understand photos
- Identifying similarities between words in a search query
- Improve ad quality
- Query understanding
- URL/Document understanding
- Search features[2]
- Crawling[1]
- User classification
- Search Ranking
- Synonyms Identification/Query Expansion
- Intent Disambiguation

Image search to understand photos: Users can upload photos on google image search and get information about the image, similar looking images, etc. There is a lot of data in the form of images on the internet. Hence, search engines can use machine learning on the huge number of images and power their feature of image searching.

Query Understanding: Machine Learning is used for understanding the search queries typed by the users. Query classification is one of the problem that is solved by using machine learning. Search engines run different classifiers on the search query. They are:

- Navigational search queries
- Informational search queries
- Transactional search queries

URL/Document Understanding: This includes everything that is done to understand a URL(Uniform Resource Locator). For example, spam detection, page classification, etc.

Intent Disambiguation: Consider an example, when you search for eagles, is it eagles the band or Philadelphia eagles or the bird or all of them together. Machine Learning is applied in these types of scenarios.

Improve Ad quality: A lot of revenue of the search engines comes from the advertisements that they display on their websites. Suggesting the advertisements that are relevant to the users increases the chance of the user actually purchasing the advertised product or service, which would, in turn be beneficial for the company providing the product or service and the search engine that advertised the product. Both will take money. Machine Learning is used by the search engines to identify the correct target audience for the showing of the various advertisements. Depending on the queries the user asks on the search engine, relevant advertisements are shown to him/her.

Identifying the meaning of words based on their usage: The number of words in the English language is constantly growing. Around ten years back, no one knew words and phrases like "selfie", "it's lit", "muggle", etc. When a word or phrase is very new

and is not used widely yet, the search engines may not be able to give its exact meaning. However, as more an more people start using it and it is written at several places on the internet, the machine learning algorithms of the search engines will gather the data and try to decipher the meaning of the word or phrase. Overtime, the search engines are able to exactly understand it.

Pattern Detection: Search engines are using Machine Learning for pattern detections that help identify spam or duplicate content. Eventhough there are still human quality raters, Machine Learning has helped Google automatically to move through web pages to weed out low quality pages without an actual having to look at it first. Machine Learning is an unevolving technology, so the more pages that are analysed, the more accurate it is.

Eliminating spam and low quality contents from search results: Machine Learning is used by the search engines to identify the spam, duplicate, or low quality content. Some common attributes of such content are the presence of several outbound links that actually link to unrelated pages, usage of stop words and synonyms in abundance, etc. Search engines try to weed out such contents from their search results so as to provide more relevant contents to the users, thereby increasing the user experience. Machine Learning has drastically reduced the human effort required to identify the low quality content. Although there are human quality raters still, the human involvement, overall, has reduced tremendously.

User classification: User Classification means figuring out what kind of a user you are. This is especially useful for personalised search.

Search Features: Machine Learning is used for generating search features like site links, related searches, knowledge graph data, etc.

Understanding User Queries: Whenever you write your question in a search engine, for example, Google, Bing, etc., the most important thing for the search engine becomes to understand what you are trying to ask. If a search engine is not able to understand what you are trying to ask or if a search engine is not able to understand your query well, it will not be able to give you appropriate answers, which would make the search engine useless for you. This is where machine learning comes into the picture. Users can make spelling errors while typing their queries in the search engines. We cannot assume a user to write all the spellings correctly. In fact, many people use search engines to verify their spellings. If you write a wrong spelling in a search engine, it shows you the correct spelling of the same word. The search engine would be smart enough to identify the word that you are typing to write, even if you have made some spelling mistake. Hence, Machine Learning is used for spelling correction in the search engines.

Synonyms Identification: If you use synonyms, even the most rarely used ones, the good search engines are able to answer your queries appropriately. The search engines are able to identify what you want to search. Machine Learning is used here too. Sometimes, users may ask queries which are a bit ambiguous. For example, suppose a user types the query "The Indian Ocean". Now, the query can imply the actual Indian Ocean band. A good search engine should be able to identify the ambiguity and work a way around it. Use of machine learning is here as well. A search engine can also classify a query into one of the various categories, for example, whether a query is navigational or transactional or information or belongs to any other category. Machine Learning is used for identification of the category of the queries. Depending on the category of the queries, the search engine may give the appropriate additional information. For example, if you search for "Westminster Abbey", you will get its information and also a Google Maps location for the same.

F Search Ranking[1]
Ranking refers to where a website or page is ranked within search engine results. A webpage rank within a search engine is commonly called as a position. Search engine ranking is the position at which a particular site appears in the results of a search engine query. Each page of the search results typically lists 10 websites, although they are sometimes augmented with local listings, videos and images. Ranking higher in the search results actually corresponds to a lower number, while ranking lower corresponds to a higher number. Many site owners engage in SEO campaigns in order to improve their search engine ranking and move their website closer to the top of the results because websites that are ranked higher typically get a larger percentage of click-throughs and attract more visitors than lower ranked websites. Search engine ranking is influenced by a multitude of factors including age of site, the quality of a site's link portfolio, relevancy of the page, social signals and level of competition, among others. Search engines rank individual pages of a website, not the entire site. This means that the homepage might rank #1 for certain keywords, while a deep internal page might be listed on the third page.

G Google RankBrain
RankBrain is a machine learning algorithm that Google uses to sort the search results, It also helps Google process and understand search queries. Google recently announced that RankBrain is Google's third most important ranking signals and it is becoming more important every day. Before RankBrain, Google would scan pages to see if they contained the exact keywords someone searched for. Today, RankBrain understands what user's are asking and it provides hundred percent accurate set of results. RankBrain tries to actually figure out what users like a human would. For instance, Google may have noticed that lots of people who search for "grey console developed by nintendo" and they have learned that people who search for "grey console developed by Nintendo" want to see a set of results about gaming consoles. So when someone searches for that search query, RankBrain brings up similar results to the keyword.
If RankBrain sees a word or phrase it isn't familiar with, the machine can make a guess as to what words or phrases might have a similar meaning and filter the result accordingly, making it more effective at handling never-before-seen search queries or

keywords. Search queries are sorted into word vectors, also known as "distributed representations," which are close to each other in terms of linguistic similarity. RankBrain attempts to map this query into words(entities) or clusters of words that have the best chance of matching it. Therefore, RankBrain attempts to guess what people mean and records the results, which adapts the results to provide better user satisfaction.

H Working of Google RankBrain
Google RankBrain goes beyond simple keyword matching. It turns your search term into concepts and tries to find pages that cover that concepts. RankBrain performs two main jobs. They are:
- Understanding search queries.
- Measuring how people interact with the results.

As the new age,google search algorithm RankBrain has induced massive quality improvement to SERP as it looks beyond mere keyword matching. This is done by looking at the big picture in the search by transforming searching terms into concepts than scouting for pages covering that concept. The rankbrain also tracks user satisfaction by understanding new keywords thanks to the ability to tweak the algorithm on its own. In other words, RankBrain as the google algorithm for search engine optimization can show search results that will get maximum liking by the users. In the results, pages liked more by users for the information can expect a better google search ranking as a fall out of the RankBrain perspective.

RankBrain takes a serious look at how a user interacts with the search results. It keeps a tab on the pogo sticking effect where unsatisfied users hit the back button out of sheer frustration at the search results. If a web page has people leaving it quickly the message to Google is the page stinks and needs remedial action. Google RankBrain will diminish pogo-sticking on a specific result and a popular page will be made easier to find. RankBrain spams websites that carry too many different topics and is without a focal area because it can't understand who will use such multiple and diverse content.

The methods Google already uses to refine queries generally all flow back to some human being somewhere doing work, either having created stemming lists or synonym lists or making database connections between things. Sure, there's some automation involved. But largely, it depends on human work. The problem is that Google processes three billion searches per day. RankBrain is designed to help better interpret those queries and effectively transalate them, behind the scenes in a way, to find the best pages for the searcher. RankBrain is paying very close attention to how users interact with the search results.
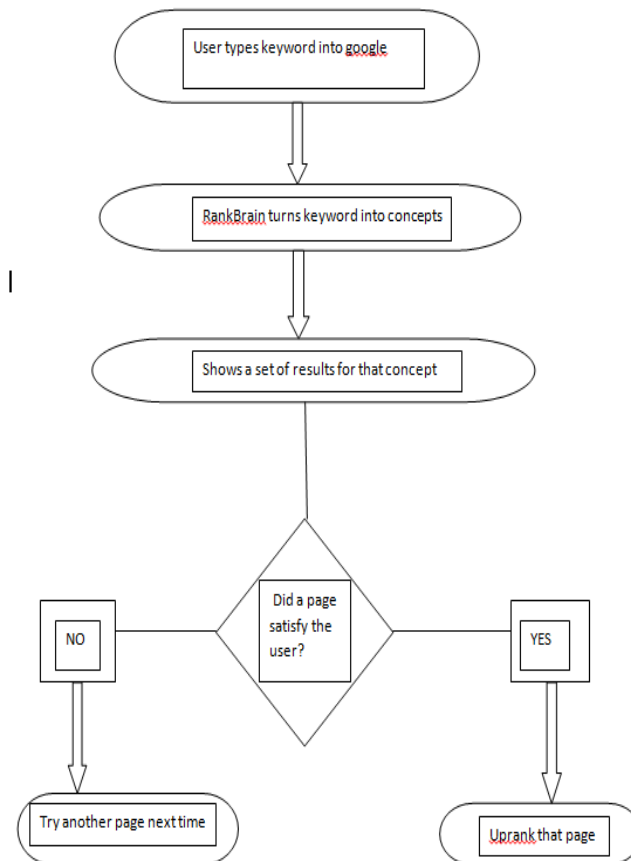

Figure H: Working of Google Rank Brain

RankBrain considers the following UX (User Experience) Signals:
- Dwell time
- Pogo sticking
- Bounce rate
- Organic click-through rate

Three essential components in the RankBrain environment are:

- Different rankings signals apply to different queries.
- Signals apply to your website's reputation.
- One keyword-one page is really,really dead.

IV. CONCLUSION

Web page ranking is a global ranking of all web pages, regardless of their content, based solely on their location in the web's graph structure. Using these web page ranking techniques, we are able to order search results so that more important and central web pages are given preference. All things considered, search engine optimization will become more resourceful in the upcoming years, but also more complex, forcing marketers to develop more elaborate strategies that bring more types of content, devices and tools into the equation. But no matter which combination of elements you see, the focus should stay on the user and their needs, as machine learning and artificial intelligence technologies will transform ranking factors that can better reflect the needs and expectations of searchers.

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