

DIGITAL OUTLET

THE CCET ACM TECH MAGAZINE

DISCOVER

DALL.E 2

An AI that turns text into art.

GÖDEL AND THE IMPOSSIBILITY OF AI

The paradox created by self-referential statements.



**ACM CCET
MOBILE APP**



VOLUME 3, ISSUE 1
AUGUST - SEPTEMBER, 2022

VISION

Chandigarh College of Engineering and Technology aims to be a center of excellence for imparting technical education and serving the society with self-motivated and highly competent technocrats.

MISSION

1. To provide high quality and value based technical education.
2. To establish a center of excellence in emerging and cutting edge technologies by encouraging research and consultancy in collaboration with industry and organizations of repute.
3. To foster a transformative learning environment for technocrats focused on inter-disciplinary knowledge; problem-solving; leadership, communication, and interpersonal skills.
4. To imbibe spirit of entrepreneurship and innovation for development of enterprising leaders for contributing to Nation progress and Humanity.

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A NOTE FROM OUR MENTORS



Our mission at CCET is not only to produce engineering graduates but to produce engineering minds.

Dr. Manpreet Singh
Principal CCET (Degree Wing)



ACM CCET provides student a great opportunity to learn scientific and practical approach of computer science.

Dr. Sunil K. Singh
Professor and HOD, CSE | Faculty Mentor



Every person should be provided with an opportunity to learn and explore the field of computer science.

Er. Sudhakar Kumar
Assistant Professor, CSE | Faculty Sponsor



CCET ACM Student chapter is a group of people with similar interests and goals in computer science. Together, this platform focuses on the growth and development at not only personal but professional level also as it has a unique learning environment.

Akash Sharma
UG Scholar, 5th Semester, CSE | Chairperson, CASC



ACM-W Student Chapter of CCET aims to promote women in technology. As a member of this community, you will have the opportunity to collaborate with others who share similar interests and explore different areas of computing in order to advance in them.

Anureet Chhabra
UG Scholar, 5th Semester, CSE | Chairperson, CASC-W



CCET ACM STUDENT CHAPTER



Research and Development



Student Speaker Program



Competitive Coding



Designing & Digital Art



Internship and Career Opportunity

ABOUT ACM

ACM boosts up the potential and talent, supporting the overall development needs of the students to facilitate a structured path from education to employment. Our Chapter CASC focuses on all the aspects of growth and development towards computer technologies and various different fields. Overall, we at CCET ACM Student Chapter, through collaboration and engagement in a plethora of technical activities and projects, envision building a community of like-minded people who love to code, share their views, technical experiences, and have fun.

We have been trying to encourage more women to join the computing field, so we started an ACM-W Chapter to increase the morale of women. CASC launched an app which aimed at maintaining decorum of reading among CS members and sharing their ideas.



CCET ACM-W STUDENT CHAPTER



Research and Development



Student Speaker Program



Competitive Coding



Designing & Digital Art



Internship and Career Opportunity

ABOUT ACM-W

The CCET ACM-W was founded in October 2021 with an aim to empower women in the field of computing and increase the global visibility of women in the field of research as well as development. We provide a platform for like-minded people so that they can grow together and contribute to the community in a way that shapes a better world. Our chapter was founded to encourage students, especially women, to work in the field of computing. The chapter's main goal is to create even opportunities and a positive environment for students, where they can work to develop themselves professionally. We at the ACM Student chapter aim to build a globally visible platform where like-minded people can collaborate and develop in their field of interest.

MEET OUR ACM TEAM



Tarun
Vice-Chairperson



Akash Sharma
Chairperson



Uday Madan
Secretary



Akshit Chhikara
Membership Chair



Aishita
Treasurer



Devashish Gupta
Web Master



Nirbhik Kakkar
Design Head



Sidharth Sharma
External PR Head



Harshit Dubey
Editorial Head



Manraj
Executive Head



Arjun Gupta
Social Media Manager



Shivam Kumar
Event Manager



Pushkar Kaushik
Creative Head

MEET OUR ACM-W TEAM



Soumya Sharma
Vice-Chairperson



Anureet Chhabra
Chairperson



Yadvika Nanda
Secretary



Rinka
Membership Chair



Smriti Kumari
Treasurer



Siddharth Singh Khati
Web Master



Kanishk Nagpal
Design Head



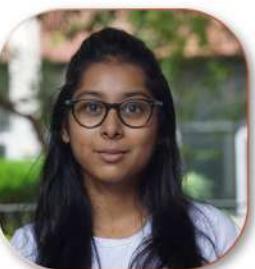
Aishita
External PR Head



Krish Kathuria
Editorial Head



Ankita
Executive Head



Vanshika Bhardwaj
Social Media Manager



Vyoam Yadav
Event Manager



Samarth Sharma
Creative Head

CASC'S RECENT ACHIEVEMENTS

CCET-ACM and ACMW provides an environment with emphasis on research and development and aims to be at par with recent trends and innovative approaches in the field of computer science.

Akash Sharma, Anureet Chhabra, Saksham Gupta, Gopal Mengi, Deepak Mahto, and Anamika Sharma, Manraj Singh, Uday Madan, and Tamanna Maan have presented their conference paper under the guidance of Dr. Sunil K Singh, Professor and HOD, CSE and Er. Sudhakar Kumar, Assistant Professor, CSE which got accepted in International Conference on Cyber Security, Privacy and Networking(IC-SPN-2022). The conference was organized on 9th to 11th September at Thailand in virtual mode.

INTERNATIONAL CONFERENCE ON CYBER SECURITY, PRIVACY AND NETWORKING (ICSPN-2022)

Certification of participation

This is to certify that the paper entitled "**Sustainable framework for metaverse security and privacy : opportunities and challenges**" by "**Manraj Singh, Sunil K. Singh, Sudhakar Kumar, Uday Madan and Tamanna Maan**" has been presented in the International Conference on Cyber Security, Privacy and Networking (ICSPN-2022) organized during September 09-II, 2022 in Thailand, (Online Mode)

Nadia Nedjah

G. Martinez Perez

Gregorio Martínez Pérez

Brij B. Gupta

Dragan Peraković

AZADI KE RANG - POSTER MAKING

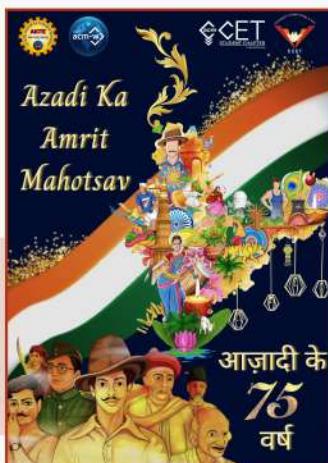
August 14, 2022

Event Details

CCET ACM & ACM-W student chapter on occasion of Azadi ka amrit mahotsav conducted a poster design contest Azadi Ke Rang to gear up the students on this INDEPENDENCE DAY inorder to bring out their innovative and creative guise by designing an E-poster. The winners were awarded with goodies by the chapter



Results



Dhwani Arora
UG scholar ECE @ UIET
1st Postion

The three winner that the student chapter arrived at were Dhwani Arora (UIET, ECE) securing the first position, Aishita (CCET ,CSE) being the first runner-up and Pravneet Kaur Bujrall as the second runner-up. The creativity and enthusiasm shown by these three was in a league of its own they were evenly matched. Their passion in their work was clear as a diamond and provided them their deserved spots.

Event Gallery

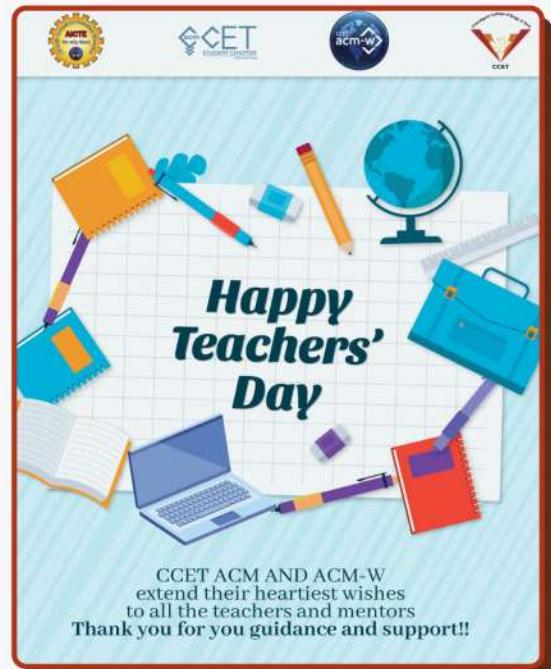


TEACHER'S DAY CELEBRATION

September 5, 2022

Event Details

Teacher's day celebrated on 5th September each year on the occasion of birth of Dr. Sarvepalli Radhakrishnan who was known as an amazing teacher of his time. Small function was organized in our school on this occasion for our beloved teachers. Teachers day function started at 12:00 A.M. morning . The function started when a small speech was given by the teachers, where they explained the importance of teachers and how teachers are the builders of nation.



Principal sir gave a speech on teachers day he told us that Great teachers have the ability to change lives for the better. Teachers can act as a support system that is lacking elsewhere in students' lives. They can be a role model and an inspiration to go further and to dream bigger. They hold students accountable for their successes and failures and good teachers won't let their talented students get away with not living up to their full potential. Teachers of all walks of life and subjects have the ability to shape opinions and help form ideas about society, life and personal goals. Teachers can also expand students' limits and push their creativity. Teaching is a tough job, but it is one where you can make the most impact in another person's life. If you're thinking of becoming a teacher, here are even more reasons why you should invest in a teaching career. In the end a cake bought by the students was cut by the teachers and every one enjoyed the celebration. The event was a success and it provided everyone with sense of respect for our teachers.

Event Gallery



UNBLOCKING THE BLOCKS OF BLOCKCHAIN

September 7, 2022

Event Details

The session focused on concepts, principles, and applications of blockchain, starting with the basics of hashing and scaling up to cover the topics of proof of work, stake, etc. Students were exposed to the real-time applications of blockchain and the talk concluded with the simulation of experiments covering various aspects of trending blockchain technology like cryptocurrency and smart contracts with the help of online demonstration using the MHRD-IIT blockchain virtual lab. A total of 80 students participated during the event.

Chandigarh College of Engineering & Technology
(Degree Wing), Sector 26 Chandigarh

Under the AICTE SPICES Scheme
brings you a session on

**“Unlocking the Blocks in
Blockchain Technology”**

Concept and Simulation, Using MHRD-IIT
BlockChain Virtual Lab

RESOURCE SPEAKER
Dr. Rahul Johri
GGSIP University, Delhi
(ACM Eminent Speaker, India)

7th Sept, 2022 Room no. 215
First Floor, Block A 02:00 - 04:00 PM

Organized By
CCET ACM and ACM-W Student Chapter
Coordinator
Dr. Sunil K. Singh

Speakers



Dr. Rahul Johri

GGSIP University, Delhi
ACM Eminent Speaker, India

The event was conducted by Dr. Rahul Johari ACM Eminent speaker, India. He is a faculty at the University School Of Information and Communication Technology, Guru Gobind Singh Indraprastha University (GGSIP), Dwarka, Delhi, India. He is the head of the Software Development Cell and head and founder of Security, Wireless, IoT Network Group of Engineering and Research Lab (SWINGER), and the ACM@USICT Student Chapter.

Event Gallery



DALL.E 2: AN AI THAT TURNS TEXT INTO ART

By Akshit Chhikara , UG scholar CSE @ CCET, co21306@ccet.ac.in

Introduction

Today, Artificial Intelligence (AI) is advancing at an ever increasing speed. Starting its journey in 1950s, innovation in the field of AI has reached to a point where it is now possible to convert text into art. This seemingly impossible task is now possible with an AI named DALL.E 2, which is capable of generating images from the text input by the user. DALL.E 2, the successor of DALL.E, was launched by OpenAI in April 2022. It has since taken the world of AI by storm with its astonishing capabilities.

Working Principle

DALL.E uses a combination of various machine learning and data processing techniques that have been greatly improved over past few years. In order to understand its working principle, it is essential to know about the individual components used to build it. These techniques are combined into a two-stage model : CLIP and Decoder Diffusion Model (un-CLIP)

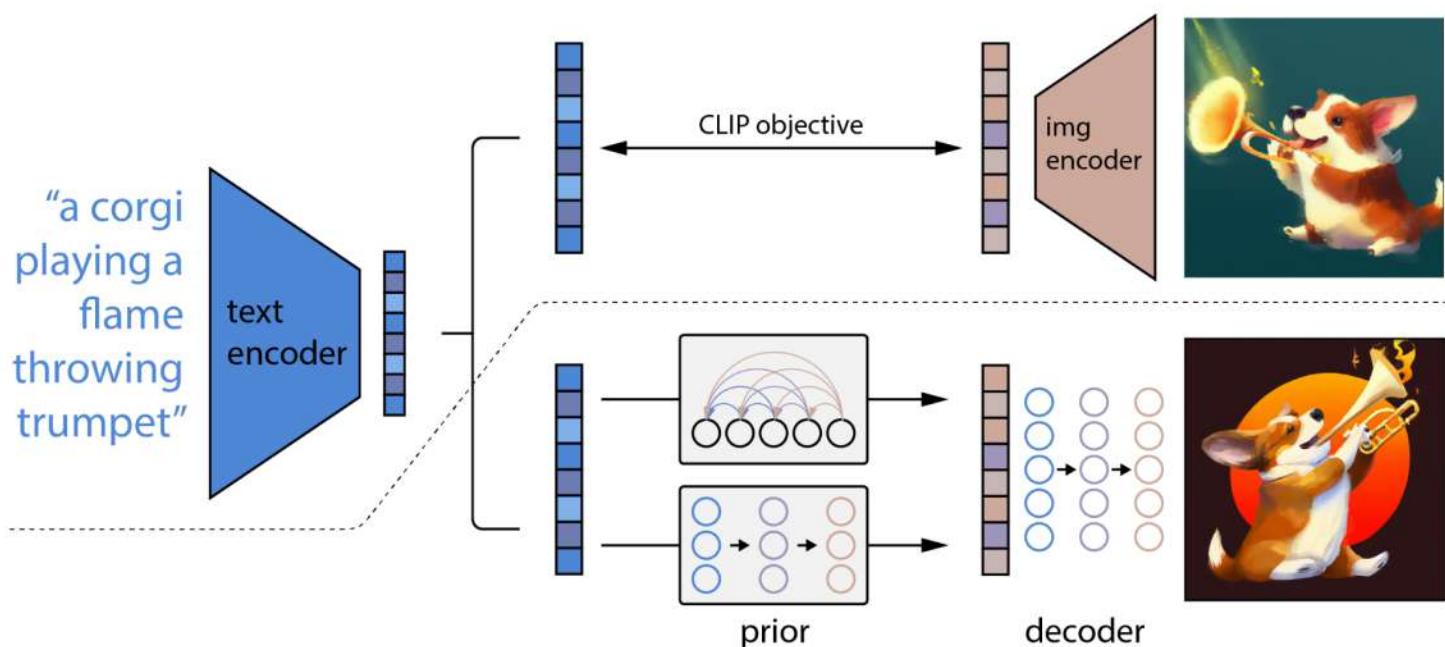
1. CLIP :

CLIP stands for "Contrastive Language Image Pre-training". It is a zero-shot learning model that takes image-caption pairs as input for training dataset and outputs the best caption for a given image in its testing and implementation. After training, CLIP has learnt associations of images that takes into account both the semantics and overall theme. CLIP does this by creating a vector space whose dimensions represent both features of images and features of language. The neural networks then finds the association between captions and image features. DALL.E 2 used 400 million text-image pairs in its training phase. Before CLIP, neural methods for computer vision involved aggregating large datasets of images, and then hand labeling them into a set of categories. CLIP embeddings have several advantages over other similar models : it has great zero-shot capabilities and is resilient to image distribution shift. CLIP is further optimized to obtain state-of-art results on different types of image and language inputs.

2. Decoder Diffusion Models (unCLIP)

unCLIP uses GLIDE(Guided Language to Image Diffusion for Generation and Editing) and diffusion models to generate images. Diffusion models pick images related to the input prompt and distorts them enough till it is unrecognisable by CLIP. After this, GLIDE gradually alters those pixel patterns towards an image

that matches the features described in the captions. This is done by removing DALL.E's text conditioning by 10% during its training, which makes it less dependent on the classifier models to allow variations in non-essential details in the generated image. This results in diversity of details in the images generated while minimizing the loss in photorealism and caption-matching accuracy .



Capabilities

Besides image generation from text input, users can also input images to generate a variety of different images inspired by the original. The model does this by keeping the overall theme and main elements of image and varying input image's trivial details. Using the "Inpainting" feature, users can select an area in image to edit and input the desired change using text descriptions. The inpainted objects in the image has

realistic physical properties with respect to its environment like proper shadows and reflections. The newest feature of DALL.E 2 is "Outpainting", which enables it to extend images beyond their original borders indefinitely with any aspect ratio. This is done by taking into account the elements and theme of original image to maintain the context of generated image and expanding the image by continuing the elements near its borders to objects which it could be.



"an old car in a snowy forest"



"a man wearing a white hat"

Improvements

DALL.E 2 works on 5 billion parameter model, out of which 1.5 billion parameters are used to increase the resolution of the generated image. Even though this number is much lower as compared to original DALL.E's 12 billion parameter model, DALL.E 2 has the capacity to generate more realistic and higher resolution images compared to its predecessor. With PCA (Principal Component Analysis), DALL.E 2 is able to retain most of

the information by reducing the dimensionality of the CLIP image from 1024 to only 319. This gives DALL.E 2 a significant performance boost compared to its predecessor. Another major improvement is its higher understanding of relationships between objects and environment in image. For example, a text input "Panda mad scientist mixing chemicals" generated an image of panda wearing gloves, lab coat and protective glasses.



an espresso machine that makes coffee from human souls, artstation



panda mad scientist mixing sparkling chemicals, artstation



a corgi's head depicted as an explosion of a nebula

Limitations :

DALL.E suffers with algorithmic bias caused by its reliance on public datasets, resulting in influences such as generating images that may represent objection-

able stereotypes in the society. For example, the prompt "Flight attendant" outputs images of Asian women whereas a prompt for te disturbing images. This

method is not fully effective because DALL.E's input filtering feature can be easily bypassed using alternative words to generate malintended outputs. For example, the word "blood" in its input is blocked but "tomato sauce" and "red fluid" are not. Another shortcoming of DALL.E is its failure to generate finer details of images such as disfigured hands with incorrect number of fingers.

Challenges :

While the artistic capabilities of DALL.E 2 were highly appreciated by the general public, it has also induced a sense of fear towards AI. Digital artists have expressed their disappointment when an AI generated image won the Colorado State Fair for digital art category on 26 August, 2022. Artists now worry that they might lose their jobs in coming future whereas others have questioned the ethics related to AI and its uses. Another problem about DALL.E and other image generation models like it is its potential for misuse by people to create deepfakes and other potentially harmful images. It is worth noting that DALL.E project is closed source and restricted to few DALL.E subscribers, due to possible misuse by people for generating violent and inappropriate images. Craiyon and Disco Diffusion are free and open-source but less powerful alternatives to DALL.E 2.

Conclusion :

DALL.E project has evolved into a very realistic text-to-image generation AI, which also shows

great artistic potential. With DALL.E 2, researchers are now a step closer to understand the way AI perceives the world and makes sense of data fed to it. DALL.E 2 might be used in many image manipulation programs after overcoming its ethical limitations in the coming future.

CLOUD CRYPTOGRAPHY

By Harshit Dubey, UG scholar CSE @ CCET, co20321@ccet.ac.in

Introduction

Cloud cryptography is cryptography that is done on a cloud-based system. This enables encryption services to be provided as software, in an accessible and cost-effective manner. Cloud crypto services are commonly offered as a managed service by hosting providers but can also be offered by dedicated parties who take on all the costs and liabilities of providing such resources. Cloud crypto services are often compared to traditional cryptography and security options that are still used today. They differ mainly in the capability they offer in terms of decentralization and availability. Cloud crypto services have greater access to resources, which makes them easily available to the public. This enables higher levels of encryption and security over individual machines that do not have to bear all the cost and responsibility for doing so.

How does Cloud Cryptography work?

Cloud cryptography is based on encryption, which uses computers and algorithms to jumble text into ciphertext. The ciphertext can then be deciphered with a series of bits and converted to plaintext with the use of an encryption key. By encrypting data stored in the cloud, cloud cryptography provides the same level of

protection. It can secure critical cloud data without causing data transfer to be delayed. To strike a balance between security and efficiency, many businesses specify various cryptographic protocols for cloud computing.

Types of Cloud Cryptography

The two most well-known types of cloud cryptography are symmetric encryption and asymmetric encryption. Both provide the same level of security and are used similarly for data privacy protection purposes on the cloud storage platforms. promise the operating system, or by programs that find flaws in the software code.

In addition, Cloud cryptography normally uses public key cryptography, which makes the data available to anyone who has access to the network on which it is transmitted. This means that any program or user with Internet access can read this data. Encrypted files can be stored on a central server or cloud storage and downloaded onto other computers without any protection.

A variant of cloud cryptography is a system for communication between data centers (between server farms) where SSL or SSH is used to secure the transfer of data. This is particularly important in

large organizations as one data center can be a single point of failure that would result in the loss of sensitive information such as intellectual property, customer database and other company assets. Cloud storage can also be used in combination with VPNs.

Advantages of Cloud cryptography

- The information is kept private for the users. Hackers are less likely to commit cybercrime because of this.
- If an unauthorized person tries to make changes, the organization is instantly notified. And only the people cryptographic keys are allowed to access
- With the emergence of this new trend in IoT, there is also a growing need for security within these networks. One form of security that is becoming increasingly popular within the IoT ecosystem is Cloud cryptography.
- Data receivers can determine if the data is corrupted, allowing for an immediate response and solution to the attack.

- Cloud crypto services allow devices to be easily secured while keeping costs low and allowing scalability.

Drawbacks

One such disadvantage of Cloud cryptography is that it is a relatively new field and research in this area is still ongoing. The technical feasibility for cloud cryptography has been demonstrated, but there are still considerations about the possible legal implications that may arise from using such services. One example of potential legal concerns arising from the use of cloud crypto services is the transfer of information beyond national jurisdiction. This can be seen as a potential breach to laws that protect certain data, for example information about transactions between businesses or personal information about individuals. Another concern may be in relation to the physical location and regulation of data storage that occurs within a cloud computing environment.



EXPERT SYSTEMS

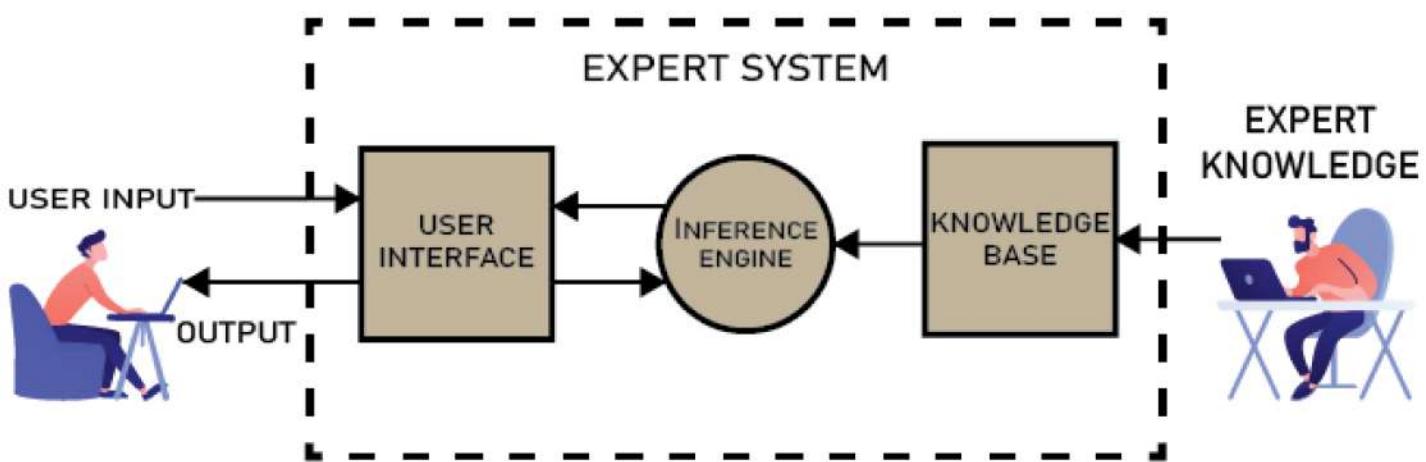
By Japan Ajit Singh Gandhi, UG scholar CSE @ CCET, c021326@ccet.ac.in

Introduction

An expert system is a computer software that uses artificial intelligence (AI) techniques to simulate the thought processes and behaviour of an individual or group of individuals with specialised knowledge in a certain field. AI is often used by expert systems to support rather than replace human specialists. Machine learning and artificial intelligence are used by expert knowledge systems to mimic the actions or conclusions of subject matter experts. Expert systems combine knowledge bases with inference or rules engines to compile experience and facts. Experts use the system to find solutions to complex issues that ordinarily call for a human specialist. Stanford University researchers Edward Feigenbaum and Joshua Lederberg created the first expert system in 1965.

Components of Expert Systems

- User interface: The area that promotes communication between the framework and its clients is known as the (UI). It receives the client's enquiry and sends it to the inference engine in a coherent form. After that, it displays the results to the client, acting as a communication interface between the client and the master framework.
- The inference engine is what gives the user interface its intelligence. It makes an effort to respond to the user's question in accordance with the established set of rules in the predefined set and the knowledge base.
- Knowledge Base: This resource, which comprises all information offered by human specialists for a specific area, can be compared to a book.
-



Benefits of Expert Systems

An expert system is a computer software that uses set rules and information to make choices rather than consulting actual experts. Expert systems can make choices more quickly, saving time and money, and are relatively inexpensive when compared to hiring human experts. Because they don't rely on human judgement, they are accurate in some fields that call for in-depth investigation and less prone to human error or emotional effect. An expert system, unlike humans, is highly adaptable and can quickly satisfy new requirements. Additionally, it may learn fresh information from an expert and apply it as inference rules to solve brand-new issues.

Application of Expert Systems

- Expert systems are used in the medical field in diagnose and medicine recommendation.

For example: CaDet is an expert system which helps in diagnosing cancer at early stages. MYCIN is another system helps in identifying the bacteria which may cause infection to a patient and can even recommend drugs accordingly.

- ROSS is an expert system which was developed for legal firms. It helps in researching information for court cases.

- FINEVA, an expert system which was developed for financial analysis of firms. It checks the firm's strength and weakness and accordingly evaluates its performance and viability.

- In banking sector, they are used for detection of frauds.

Drawbacks of Expert Systems

Expert systems lack common sense since they only rely on internal inference rules and make decisions in accordance with them. Under unusual circumstances, it is unable to make original decisions. Making inference rules for an expert system is challenging and requires extensive knowledge in order to prevent errors and offer a suitable solution. Even so, it might not offer a problem-free solution.

Future of Expert Systems

An expert system can work more efficiently than humans and can provide accurate solutions to a great extent. Many expert system prototypes are being developed by researches in their respective domains to speed up their work, provide accurate results and reduce human inefficiency. But few believe we cannot completely rely on expert systems, for example a doctor cannot be replaced by an expert system. On the other hand, few believe if humans and expert systems work in coherence with each other, the output and accuracy will increase.

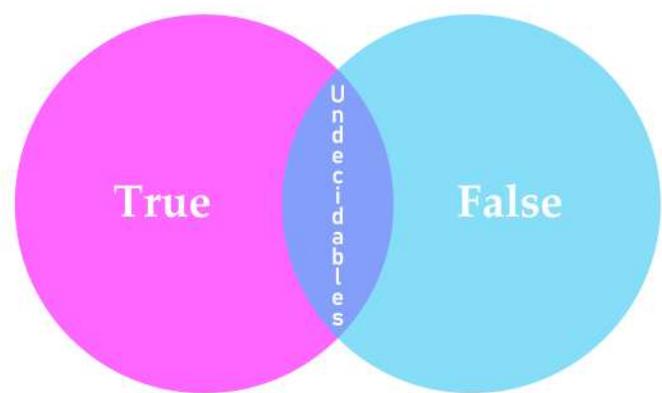
GODEL AND THE IMPOSSIBILITY OF AI

By Krish Kathuria, UG scholar CSE @ CCET, co21337@ccet.ac.in

The hunger in the field of mathematics and computer science to create a system which can explain everything or to create such a machine that can replicate or even succeed the human brain and its capacities has always been alive. This hunger has led to the conception of artificial intelligence which by definition means intelligence shown by a machine, but before computer science emerged as separate academic discipline, several attempts have been made in the field of mathematics to create a formal system of basic axioms from which all theorems of mathematics can be proved. Such an attempt was made by Bertrand Russel and his colleague Alfred North Whitehead in their book called *Principia Mathematica* that all mathematics should be derivable from logic. These claims were not only brought down by Kurt Gödel and his theorem of incompleteness, but it also revolutionized the field of mathematics and computer science forever. The theorem of incompleteness states in common mathematical terms:

Every attempt to create a consistent and complete axiomatic system will fail due to the presence of undecidable propositions.

Godel's Incompleteness Theorems



No consistent system of axioms is capable of proving all truths about the relations of the natural numbers, and such a system cannot demonstrate its own consistency.

To understand and apply the incompleteness theorem on artificial intelligence, the terms consistent, complete, and undecidability require analysis. Gödel's theorems articulated the limitations of mathematical proofs. A proof is a rigorous logical argument that decides the truth of a hypothesis using axioms (self-evidently true statements) and rules of inferences (algorithms) which are part of every system built on mathematics. Such a system is consistent i.e., does not contradict itself if a given hypothesis and its negation both are provable, and is complete if any statement or either its negation is provable using the axioms and the rules of inference of that particular system. Gödel's proof of incompleteness can be informally explained through the paradox created by self-referential statements. Consider the sentence:

This statement is false.

If the answer to the question whether the statement is true is yes that'll make the statement false and if the statement is false, that implies that it is true. By directly referring to itself, this statement creates an unsolvable paradox. So, if it's not true and it's not false—what is it?

Assuming the mathematical system is consistent and complete this contradiction means that we now have a true equation of mathematics whose truth is undecidable. Furthermore, Gödel's argument applies to every axiomatic system. Therefore, perfectly complete systems using mathematics cannot be created and the

fact that is worth noting is that artificial intelligence at its base is a collection of algorithms programmed on a Turing machine which are based on mathematics.



In his article *Minds, Machines and Gödel*, J. R. Lucas explains why he believes that Gödel's Theorem draws a line between the mind and the machines created by it, one that no machine can ever cross. He contends that no matter how complex a machine we create, the fact of the matter is, it will be based on a formal system, on which the incompleteness theorem will be applicable generating a formula that cannot be proved within that system. Although a mind can recognize that this formula is true, a machine will be unable to create it as being true. Therefore, the machine will not serve as a sufficient mental model. He is implying that Gödel's Theorem holds true for each machine that can be constructed and that although a specific statement will exist which is true, the computer is blind to the statement's correctness from outside the formal system of the computer." A man therefore has knowledge that the computer does not have concluding that a computer can never be as intelligent as the mind even in principle.

But we all know Artificial Intelligence is not only a dream realized, but it has also gone to lengths of being a source of fright and concern for certain people. But Lucas did raise a valid argument one which must be rebutted. The mind can be viewed as a reliable formal system that can entertain contradictory concepts. This is necessary if the mind is to be able to produce indirect proofs, which rely on the mind's capacity to first create and then recognize inconsistency.

Indirect proofs rely on the use of a hypothesis (assumed to be false) to produce a statement that is inconsistent with existing facts, thereby proving that the opposite of the hypothesis is true. As a result, minds can act in ways that are both consistent with formal systems and inconsistent with them. Therefore, the idea of creating a machine that resembles the human mind will behave like the human mind i.e., both inconsistently and consistently.

NATURAL LANGUAGE PROCESSING

By Vanshika Bhardwaj , UG scholar CSE @ CCET, co21366@ccet.ac.in

Lately, it was considered that AI is superior to humans at decision making based on pre-defined data but lacked in terms of cognitive and creative ideas. But with later advancements in AI, this conception was changed.

One of the most prominent advances was Natural Language Processing (NLP). NLP is a sub discipline of AI that deals with interaction of machine with human language. It involves analyzing the data and interpreting its meaning . It is an evolution of computational linguistics, statistic modelling, and ML concepts.

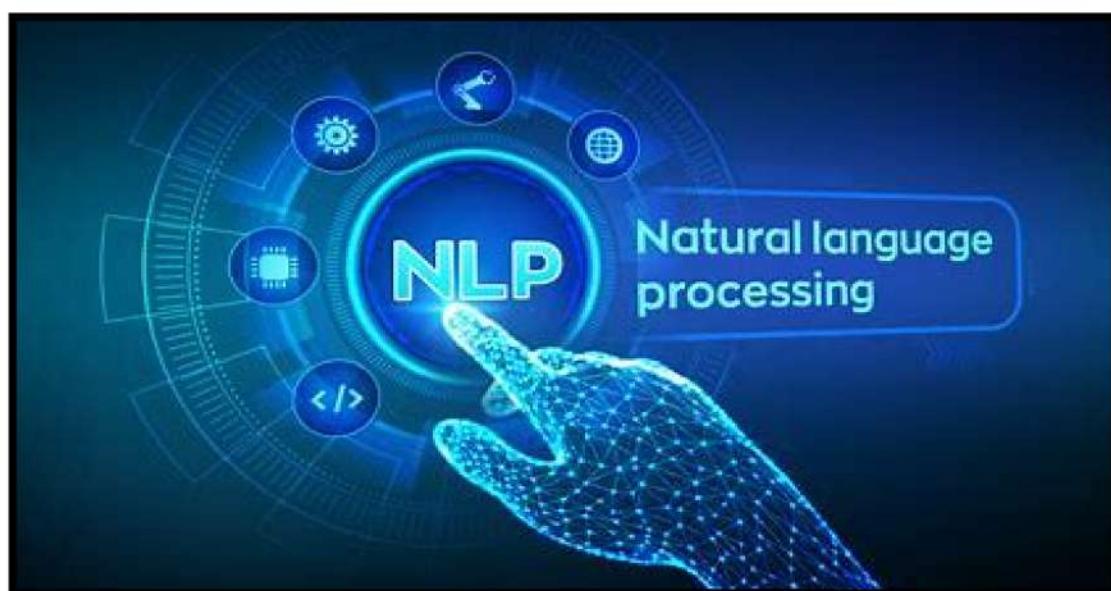
Language Models in NLP

Language model is a statistical model that helps determine the probability of

occurrence of words based on past data inputs. Language model is considered as the backbone of NLP. It comprehends datasets, analyses the information and develops insight for prediction. With the use of language models people can communicate with the machine the same way as they interact with each other but to a limited extent. One of the basic daily life use of language model is prediction of text input on mobile or Google search.

Examples of language modelling in NLP

1. **Speech Recognition:** It processes the speech-audio commands and translates the words spoken into text. The ASR (automatic speech recognition) examines



the sentiments by differentiating between the words such as write-right, compliment-complement etc. Common examples of voice assistant that uses speech recognition are Alexa, Siri, Google homes.

2. **Machine Translation:** Google translator and Microsoft translator are two basic language model that are used to translate text from one language to another.

3. **Parsing:** Involves analysing string of symbols and extracting exact meaning from the text in accordance with rules of grammar.

4. **Optical Character Recognition:** Uses machine to convert image of text into machine encoded text.

Applications of NLP

1. **Chatbots:** Chatbots are build using Natural language processing and machine learning which enables them to interpret the complexity of the language and derive its actual meaning. Also it can learn from the past conversations and become better with time.

2. **Auto Correct:** Grammar checking software and auto correct tools uses natural language processing to detect grammatical, spelling or sentence structure errors.

3. **E-mail Filter:** One of the basic online applications of NLP is email classification. Based on the content email is divided into three sections (primary, social or promotions) which helps to manage mails and access the relevant ones quickly.

4. **Search Results:** Auto complete feature on search engines use NLP to predict the complete sentence. It uses various data

sets to determine what the user wants to type when particular phrase is entered and displays the predicted results.

Challenges to NLP

1. **Ambiguity:** Ambiguity exists when a phrase tend to have more than one possible interpretation. It can be in form of lexical (word-based), semantic (context-based) or syntactic (meaning-based).

2. **Development Time:** To develop a sufficiently trained NLP system enormous amount of data sets needs to be reviewed and processed by AI. GPUs and deep network can help reduce the training period by a few hours. However, the total time taken to build the system from scratch remains large.

3. **Uncertainty:** NLP is capable of detecting intelligible words but can't address false positives or uncertainty which leads to indecision. Thus there is a need to develop a NLP system that can deal with uncertainty.

Conclusion

NLP is one of the fastest growing technologies which is expected to make huge leap in the upcoming decades. It is used in data analysis, visualization, web search, content analysis and is completely going to change the way how we communicate with the machine. NLP services are largely adopted in industries such as health-care, automotive, manufacturing etc.

NEUROMORPHIC COMPUTING: THE NEXT-GEN OF AI

By Kartik, UG scholar CSE @ CCET, co21333@ccet.ac.in

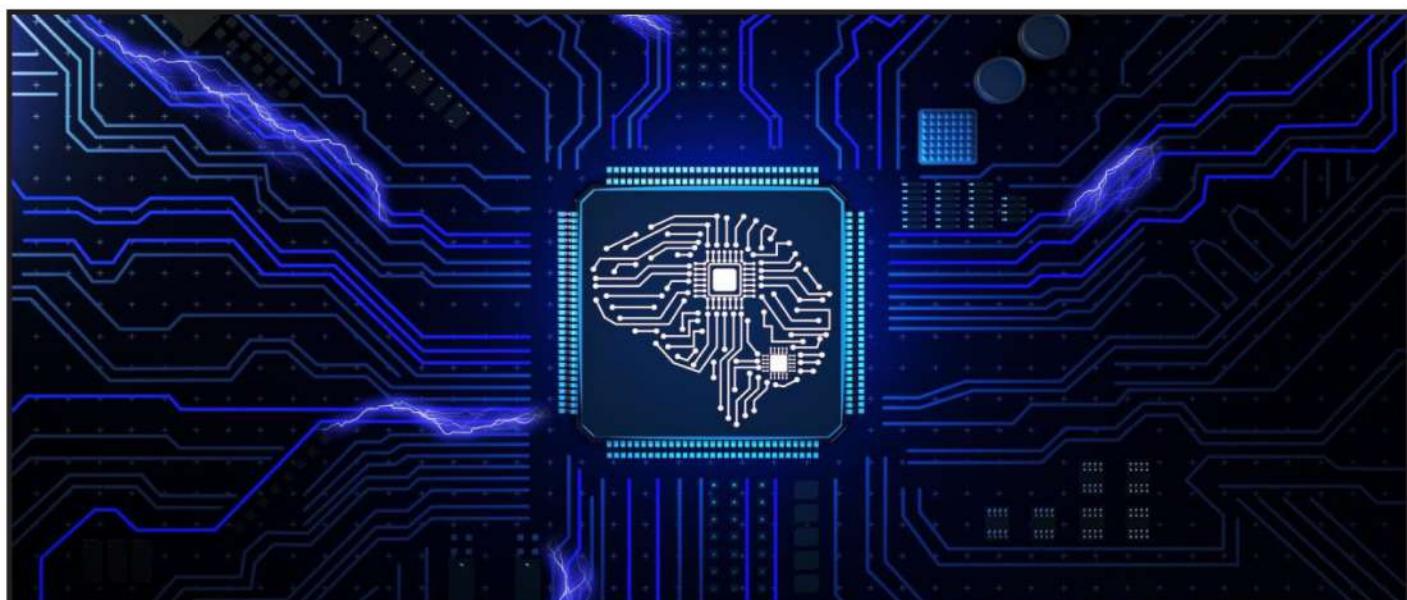
Neuromorphic systems are a better alternative than Von Neumann computer architecture and provide better solutions to artificial intelligence systems. Neuromorphic computing is inspired by biology and models the human brain using artificial neural networks. It works under a multidisciplinary paradigm of computing biology, and neuroscience.

HOW DOES NEUROMORPHIC COMPUTING WORK?

Neuromorphic computing incorporates Spiking neural networks in order to simulate the functioning of the neural network of the brain . While the conventional computing relies on transistors , the Spiking neural networks are able to transfer information just like in the temporal

and spatial dimensions as the brain. As a result of this similarity higher number of outputs are produced. These neural systems have the softwares or memristors which serve as the synapses resulting in the system to be either digital or analogue.

With the ability to store and transfer information, memristors are used to simulate the useful aspect of brain synapses . The memristors can replicate the way the strength of a connection between two synapses varies. The memristor technologies like phase change memory, conductive bridge RAM, torque magnetic RAM are being used in order to find ways to imitate the brain's synapse, such as employing quantum dots and graphene

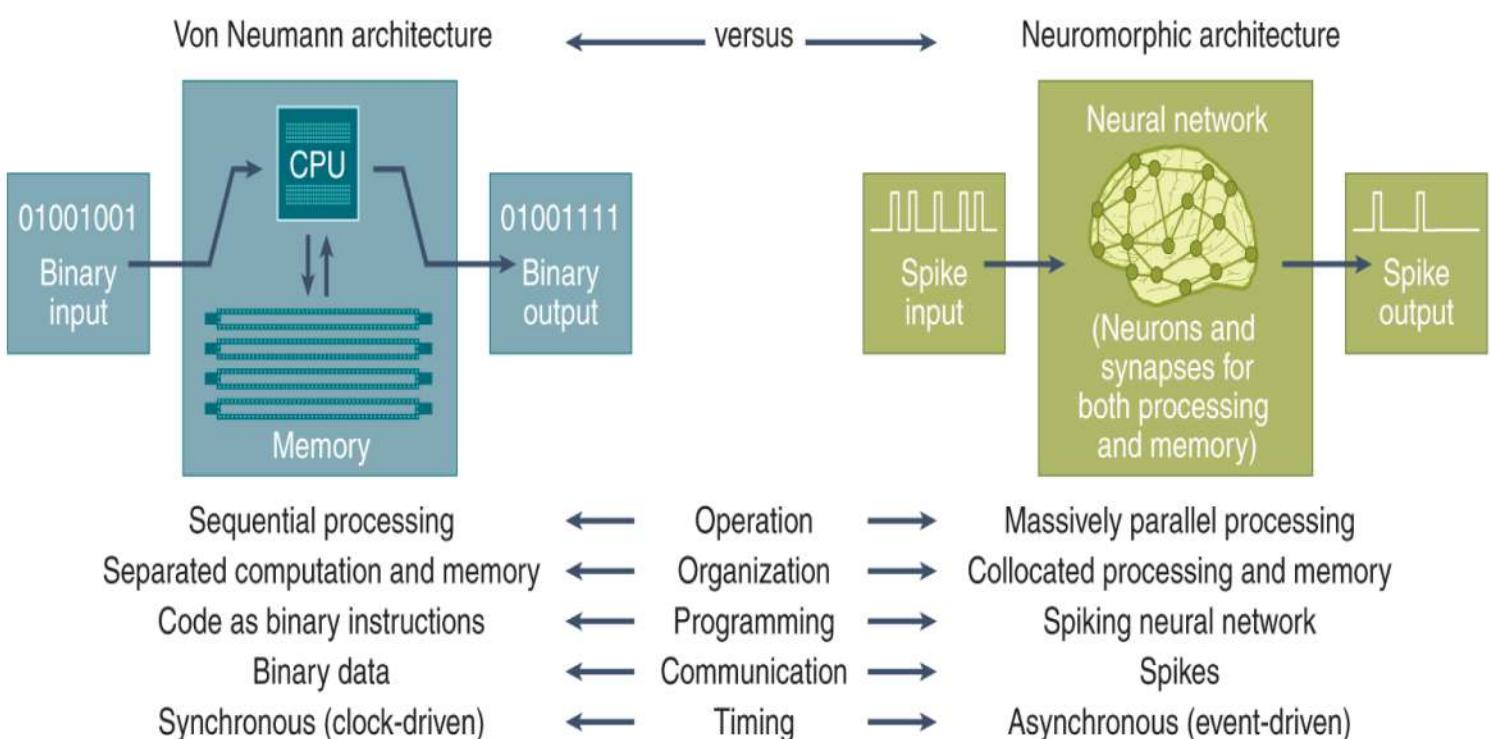


FEATURES OF NEUROMORPHIC COMPUTING

Nowadays, neuromorphic computing has grown to be a popular structure of desire in place of the von Neumann computing structure for packages, also including process related to cognition. With the help of extremely identical artificial neurons and synapses, physiologically stimulated procedures are constructed in order to gain theoretical neuroscientific trends and tough system investigating ways. Therefore, the conventional Von Neumann systems are being replaced by systems that use neuromorphic computing for calculations.

In order to implement the Neuromorphic architectures certain requirements such as optimum parallelism and connections, reduced energy intake and better processing. Along with performing complicated executions at a higher speed as

compared to conventional von Neumann systems , it also reduces the length of carbon footprint by saving energy . There are ten principal motivations for the use of neuromorphic structure, along with improved overall performance, Adaptability, Parallelism, Faster, Lower energy cost, better Tolerance to the failures, leaning at a higher pace, and Neuro science. Out of all the features the principal driving force is the improved overall performance provided by the neural network based system. With the help of hardware-multiplied computing and parallelism these systems are frequently capable of handling neural computing packages quicker than the conventional systems. For the past many years, the targeted region for improvement in the Neumann system has been low energy intake which has become a feasible through the neural network based



system. As we are aware that the biological neural networks are asynchronous in nature, thus coping with the verbal exchange of asynchronous and event-pri-marily based total missions in huge structures is hard in the conventional architectural system. Due to its computational capabilities and high processing power within the neuron nodes , the hardware implementation of neuromorphic computing benefits the large computing structures by achieving ultra-low energy consumption while processing records. Because of all of the benefits listed above, it is far more important to remember that the neuromorphic structure is better than the existing Von Neumann system.

APPLICATIONS IN REAL LIFE:-

1) MEDICINE

Neuromorphic devices have great potential in prostheses and also in improving the medication administration within the body. If neuromorphic devices are used in place of Traditional prosthetic devices then a person can have a continuous and sensible and more stable experience. Its sensitivity allows it to release medication as soon as it detects any foreign entities inside the body of a person. A laptop which possesses the capability to behave like human mind may also have the power to mimic the human mind, which includes diagnosing diseases like Alzheimer's.

2) ARTIFICIAL INTELLIGENCE

Neuromorphic computing having neurons which are energy-efficient in pro-

cessing and extraordinarily speedy may be able to push the capabilities of the AI technologies and get closer to the functionality of the human mind .

According to a report, there is a system known as the SpiNNaker which is able to imitate some limited functioning of the brain. The project attempted a unique approach by utilising typical digital components that communicate and interact with one another using novel techniques. It is projected that it may be possible to improve its processing power and performance while using less energy and also resulting in faster speeds.

FUTURE OF NEUROMORPHIC COMPUTING

In the near future there is a high possibility that Neuromorphic computing will become the driving force and advancement of artificial intelligence. As of now, Artificial Intelligence faces many hurdles in the form of storage capacity and costly processing hardware. Thus with the development of neuromorphic systems we will be able to tackle all these problems and improve the applicability of AI in the various sectors and use AI to its full capability.

UNDERSTANDING BIG DATA

By Eshita Badwal , UG scholar CSE @ CCET, co21316@ccet.ac.in

In 2010 google was processing around 20,000 terabytes of data in a year. In 2018, Walmart collected 2500 tera bytes of customer data per hour. Today, the world generates about 1,000 petabytes of data every day! As internet users increase and technology is progressively integrated into everyday things, the amount of data increases in size and complexity, at an exponential rate. These large sets of data are termed as Big Data. Have you heard of smart fridges, smart wearables, bulbs etc.? Are you active on any social media websites? Do you shop online? All these activities generate data. Even navigating a website contributes to user data. The large volumes of ever-increasing data from all these varied activi

ties contributes to “Big Data”.

Big data comes from diverse sources, which enables us to derive lots of useful information by correlating data. For example, a large set of patient brain scans is data, but when linked to the patients' medical records, location, the weather conditions, daily activity etc. they constitute big data. This data can be effectively analyzed for patterns to make predictions that are more accurate because of the sheer size of the data being analyzed. Hence, analysis of big data can have a significant effect in activities pertaining to varied sectors ranging from healthcare to finance and businesses.



Managing Big Data

An organization can effectively manage big data using the Big Data Value Chain. This value chain consists of a series of value adding activities which comprise an effective system to manage information.

These activities are:

Acquisition of data: This step involves collecting, filtering and ordering data before storing it in a data warehouse where data analysis can be performed. The infrastructure required for data acquisition must be able to handle high volumes of data; have low latency and be flexible.

Data analysis: it involves preparing volumes of raw data for domain specific usage. Using data analysis data can be modelled to highlight relevant information and also extract useful information. Apache Hadoop, MongoDB are some of the tools used for big data analysis.

Data curation: Big data is dynamic and ever increasing. Data curation is therefore necessary for active management of constant data influx. Data curators ensure the quality and accessibility of data.

Data Storage: Because we are working with large volumes of high velocity data, its storage must be scalable. That is, data must be easy and quick to access, for applications. Traditionally Relational Database Management Systems have dominated the storage paradigm. But RDBMS is insufficient and inflexible, so alternative NoSQL databases are preferred for big data storage.

Data usage: data usage involves giving access of data and its analysis to targeted

sections like business, consultancy firms etc. so that they can integrate the analysed data with activities as per requirement.

Why Big Data?

Businesses process big data to identify trends, patterns and behaviors which help them improve customer experience. The ability to gather and analyze huge volumes of data positively impacts organizations by promoting cost optimization and boosting sales. Amazon, for example processes the history of purchase and clickstream data of more than 300 million users which helps them analyse site navigation behaviours and track user trends and create a better and custom user experience.

Machine learning, a field which is actively reinventing machines by infusing self-learning in them, needs data at its very core. Technologies like virtual assistants, language translations, shopping recommendations etc. are all supported by it. But machine learning wouldn't be possible without sufficient data. This is because, machine learning algorithms analyse data and use it to make predictions. Simply put, training machines is not possible without large datasets.

Big data finds its applications in so many other fields like healthcare, accounting, sales, military, traffic management etc. Many upcoming technologies like predictive modeling, which deals with analyzing data to predict future outcomes are supported by data analysis.

The Debate about Big Data

Despite the tremendous scope and applications, there are some challenges associated with big data. If not harnessed responsibly, big data can cause serious privacy and security concerns. For example, there are complaints that human analysts actually listen in on people's conversations with their virtual assistant without their consent. Most apps now-a-days require access to contacts, camera, location, messages and microphone even if their functioning doesn't directly involve these things. All these things breach individuals right to privacy. This has made many people resist the idea of data col

lection and monitoring.

Conclusion

Over the years, data has become very valuable. So much so, that companies like Google make huge profits in selling their user statistics. But, in this digital age, where data is very powerful, companies have a huge responsibility to their users. They need to be transparent about the data they track and how they use this data. Also, instead of burying information in lengthy terms and conditions, they must be upfront about the facts. Data in itself is neutral. It all comes down to us, to make ethical and responsible usage of data.

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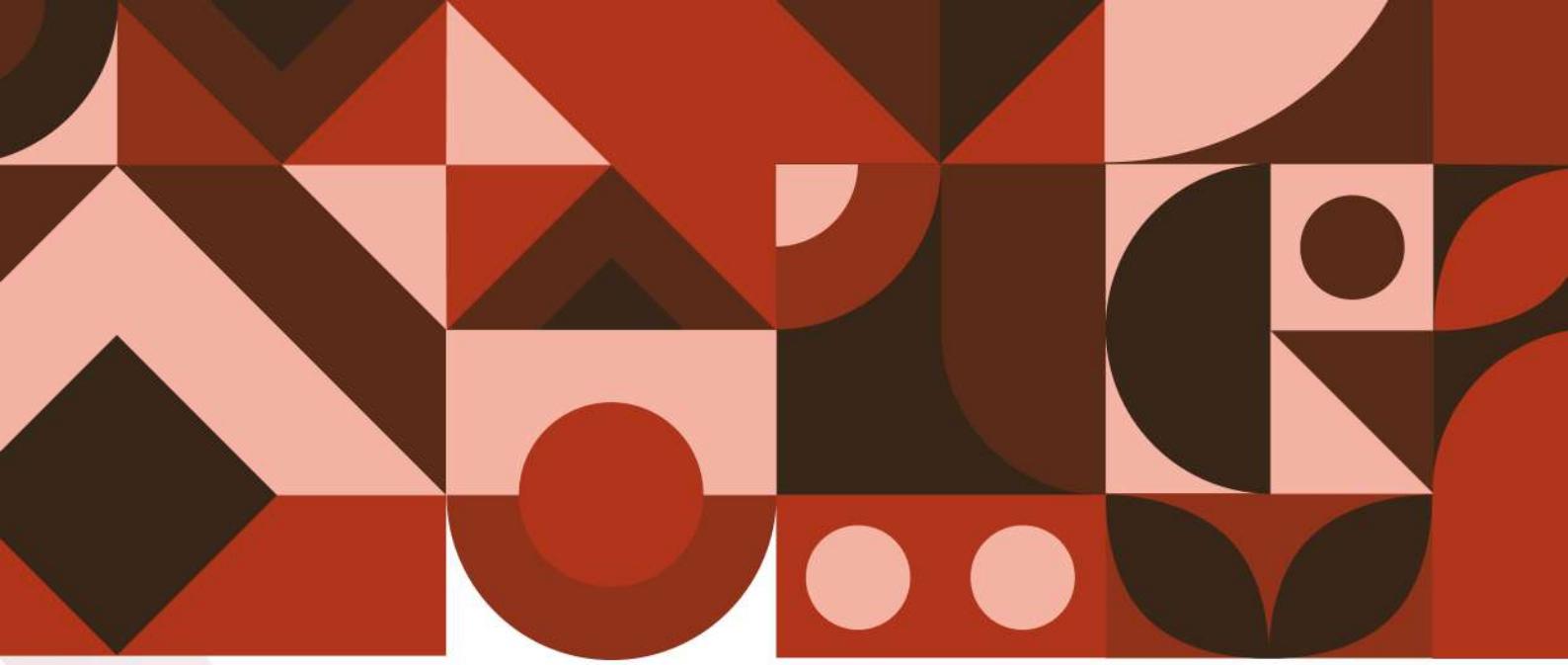
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Matt Mullenweg
Founder, WordPress

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