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MACHINE LEARNING

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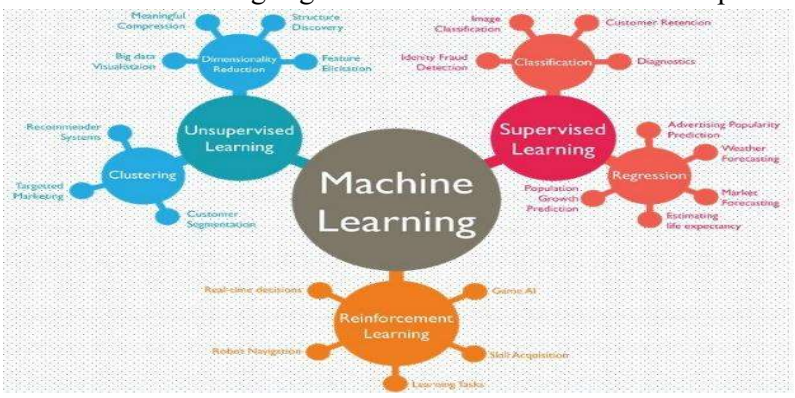
Machine learning (ML) is a type of artificial intelligence (AI) that allows software applications to become more accurate at predicting out coming without being explicitly programmed to do so. Machine learning algorithms use historical data as input to predict new output values.



WHY MACHINE LEARNING IS IMPORTANT?

Machine learning is important because it gives enterprises a view of trends in customer behaviour and business operational patterns, as well as supports the development of new products. Many of today's leading companies, such as Facebook, Google, and Uber make machine learning a central part of their operations. This machine learning has become a significance competitive differentiator for many companies.

ADVANTAGES AND DISADVANTAGES OF MACHINE LEARNING:

ADVANTAGES:

- Step forward automation
- Analyzing the pattern
- Broad application
- Data Handling
- Simultaneous execution
- Open opportunities
- Reduce time and complexity

DISADVANTAGES:

- Selecting Algorithms
- Error-prone
- Data acquisition and inconsistency
- Excessive use may harm mankind

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NEUROMORPHIC COMPUTING IN AI

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Neuromorphic computing is **a method of computer engineering in which elements of a computer are modeled after systems in the human brain and nervous system**. The term refers to the design of both hardware and software computing elements.

Neuromorphic engineers draw from several disciplines -- including computer science, biology, mathematics, electronic engineering and physics -- to create artificial neural systems inspired by biological structures.

HOW DOES NEUROMORPHIC COMPUTING WORK?

Traditional neural network and machine learning computation are well suited for existing algorithms. It is typically focused on providing either fast computation *or* low power, often achieving one at the expense of the other.

Neuromorphic systems on the other hand, achieve both fast computation *and* low power consumption. They are also:

- massively parallel, meaning they can handle many tasks at once;
- high in adaptability and plasticity, meaning they're very flexible;
- able to generalize; and.

CHALLENGES OF NEUROMORPHIC COMPUTING

Neuromorphic computing is an emergent field of technology that is mostly still being researched. Only recently have there been any attempts at the practical use of neuromorphic computer architectures. The most recent developments in neuromorphic hardware have the potential to improve the efficiency of current neural networks, which currently run on somewhat inefficient graphic processing units (GPU). However, a functional human brain chip is still a long way off.

USE CASES

Experts predict that when neuromorphic computers do come into their own, they'll work well for running AI algorithms at the edge instead of in the cloud because of their smaller size and low power consumption.

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REINFORCEMENT LEARNING

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Reinforcement learning is the training of machine learning models to make a sequence of decisions. The agent learns to achieve a goal in an uncertain, potentially complex environment. In reinforcement learning, an artificial intelligence faces a game-like situation. The computer employs trial and error to come up with a solution to the problem. To get the machine to do what the programmer wants, the artificial intelligence gets either rewards or penalties for the actions it performs. Its goal is to maximize the total reward.

Reinforcement learning is also used in operations research, information theory, game theory, control theory, simulation-based optimization, multi agent systems, swarm intelligence, statistics and genetic algorithms.

The purpose of reinforcement learning is for the agent to learn an optimal, or nearly-optimal, policy that maximizes the "reward function" or other user-provided reinforcement signal that accumulates from the immediate rewards. This is similar to processes that appear to occur in animal psychology.

TYPES OF REINFORCEMENT LEARNING

1.POSITIVE

Positive Reinforcement is defined as when an event, occurs due to a particular behaviour, increases the strength and the frequency of the behaviour. In other words, it has a positive effect on behaviour

2. NEGATIVE

Negative Reinforcement is defined as strengthening of behaviour because a negative condition is stopped or avoided.

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CURRENT ARTIFICIAL INTELLIGENCE (AI) : 7 TRENDS TO WATCH FOR IN 2022

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1. DATA WRANGLING TOPS THE AGENDA.

"Most AI models are hungry for massive amounts of data, and organizations need to build flexible data pipelines that can evolve to support thousands of sources, incorporate structured and unstructured data, and provide it to data scientists in a meaningful and reliable way," says Erik Brown, a senior partner in technology at West Monroe. "Traditional ETL (extract, transform, and load) and relational stores must be complemented for more scalable data lakes, and in many cases data streams must be provided to be processed in real-time."

2. AUTOMATED PROCESS DISCOVERY BOOSTS RPA EFFORTS.

"Though not purely focused on automation opportunities alone, these technologies will provide process related insight not gained by any other means," says Wayne Butterfield, director at ISG. Process mining, task mining, and the up-and-coming conversation mining enable "lean on steroids," Butterfield says, giving the enterprise more autonomous means of developing a robotic process automation (RPA) pipeline.

3. AI ENABLES EFFECTIVE SUPPLY CHAINS.

Intelligent supply chain applications should become the rule rather than the exception going forward. "From supply and demand planning to digital manufacturing and logistics, supply chains in 2022 will need to be continuously transformed, AI-enabled, and most importantly given all the recent disruption, future-proofed," says Kurtz of Capgemini Americas.

4. CUSTOMER-FACING AI PLOWS AHEAD.

"The pandemic saw AI adoption in customer-facing roles such as virtual agents increase, "says Joshi of Everest Group. "This will continue but with more maturity and complex use cases."

5. NATURAL LANGUAGE GENERATION (NLG) GOES MAINSTREAM.

OpenAI recently made its GPT-3 large language model, already being used by hundreds of apps, available by API. The most public example of the power of NLG, GPT-3 can be used in applications that require a deep understanding of language, from converting natural language into software code to generating answers to questions. "The possibilities are endless, with GPT 3 also being used to create unique training data sets for NLP, real-time generation of unique responses in conversational AI platforms, and the capability is even being used to generate software code. 2022 should see even more uses of NLG, and really catapult it to the masses."

6. TALENT SHORTAGES THREATEN PROGRESS.

"The market has never been more competitive for people with AI skills, and this trend is likely to continue for years to come. As such, strategic partnerships will also be key across organizations and industries."

7. AI TRANSFORMS IT PRODUCTIVITY.

The increasingly complex and powerful IT environment of the future is too much for human tech pros to manage alone. "Another area of increased AI adoption will be managing modern systems that CIOs are building," says Joshi of Everest Group. "These systems cannot be just managed by humans. The observability, intervention, and deep analysis needed for these systems will be AI-enabled." Joshi is looking for real-time, actionable interventions. This area has been researched for a long time, he notes, but meaningful progress has been made recently.

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ARTIFICIAL INTELLIGENCE IN SELF DRIVING CARS

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Self-driving cars are also called "driverless" cars since they operate and drive the vehicle using sensors and software. They're the ones in which human drivers are never necessary to take control in order to run the vehicle properly.

LAYERS OF AUTONOMY

Researchers have categorised vehicles into 5 levels according to the capability of different levels of automated driving.

- Level 0: Humans are in charge of all primary controlling systems. For example, our typical human driving vehicles.
- Level 1: The car can handle certain systems, such as cruise control or automated braking, one at a time.
- Level 2: The car performs at least two autonomous activities at the same time, such as acceleration and steering, but requires human intervention for safe operation.
- Level 3: Under certain conditions, the automobile can manage all safety-critical activities, although the driver is expected to take control when notified.
- Level 4: In some driving circumstances, the automobile is totally autonomous, but not in all situations.
- Level 5: In every condition, the car is fully capable of self-driving.

COMMON FEATURES OF A SELF-DRIVING CAR

Many of today's consumer cars have a lower level of autonomy but nevertheless have some self-driving capabilities. As of 2019, several cars include self-driving features such as:

- Down to a stop, adaptive cruise control (ACC) maintains a present gap between the driver's automobile and the vehicle in front of it.
- When the driver crosses lane markers, lane-centring steering automatically nudges the car toward the other lane marking.
- Vehicle-to-Vehicle (V2V) communication is a wireless method of exchanging information about the speed, location, and distance of nearby vehicles.V2V communication technology allows cars to send and receive Omni-directional messages while also providing 360-degree “awareness” of other vehicles in the vicinity.
- Electronic Stability Control (ESC) is an automated function that assists in retaining control in crucial driving circumstances by using automatic computer-controlled braking of individual wheels. When the driver loses control of the car, the function activates.

HOW IT WORKS

Self-driving automobile systems rely on artificial intelligence. Large amounts of data from image recognition systems are used by the self-driving car to operate the car properly. It follows machine learning and neural networks to make decisions in a situation.

Machine learning algorithms receive the data via neural networks, which find patterns. The neural network algorithm is trained to detect traffic lights, pedestrians, street signs, and other features of any given driving environment using cameras.

The pros and cons of self-driving cars

Pros

- Safety: With human error accounting for more than 90% of automobile accidents, the introduction of autonomous cars has the potential to make our roads considerably safer.
- Equity: Another essential aspect to think about is equity. People who are unable to drive on their own, such as the old or handicapped.
- Environmental: The majority of self-driving cars on the road today are electric. While the battery charge does contribute to emissions indirectly (unless it is fuelled entirely by renewable energy), it does so at a far lower level than a typical gasoline or diesel engine.
- Hacking and Malfunctions: Hacking is a possibility, as it is with any technological advancements. Self-driving vehicles may be hacked to obtain access to the driver's personal information, or worse, to take control of the vehicle's steering or acceleration.
- Lack of trust: It's accepted that normal driving carries risks, but we, as drivers, have some control over the situation. But, unlike human drivers, we have a far lower tolerance for mistakes caused by this modern technology than human drivers.

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INTELLIGENCE AND HUMAN JOBS

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Everywhere you turn today is some unbelievable technological advancement on a variety of fronts. In our everyday lives, we hear or experience things about autonomous vehicles, warehouse robots, chatbots, Alexa, Siri, Uber, automated email responses, robotic surgeries, Netflix recommendation systems, smart factories, smart buildings and search retargeting. Technology Giants are typically revolving around a variety of enabling technology layers, namely, Cloud Computing, Computational systems, Networks and Sensors, Robotics, Material sciences, Digital manufacturing and Artificial Intelligence. However, at the centre of it, is **AI** that permeates many of the other advances in some shape or form in creating intelligent systems on top of advances in core Products or Technologies.

Although **Artificial Intelligence** dramatically improves our world in many mays, there are notable concerns regarding forthcoming **impact of AI on employment and workforce.**

"Computers, Intelligent machines and Robots seem to like the workforce of the future. And as more and more jobs are replaced by technology, people will have less work to do and ultimately will be sustained by payments from the government", predicts Elon Musk, the cofounder and CEO of TESLA. This is scary proposition in some sense, in that what will we do if all the work is done by AI or Robots? Don't we have enough economic disparity and can barely make ends meet today? To add insult to injury, many of the analyses seem to centre on displacing the low wage workers. As if they didn't have enough disadvantages already, their entire economic class will be wiped out is the feeling we get from the news cycle. This is evidence by robotic warehouses and chatbots or automated customer service and we can really feel the changes all around us.

There are predictions talking about millions of unemployed people in the next decades-primarily due to the impact of Intelligent Automation and AI Systems.

SECTORS THAT WILL BE IMPACTED

Transportation is already in a transformation mode – fully autonomous cars will be soon a reality, and they will be safer, more efficient, and more effective. **Professional drivers** (taxis, trucks, and more) will see the demand for their skill set dropping rapidly.

Electronics commerce will also undergo a significant transformation: fulfilment centres will be fully automated, with robots navigating the space to collect products and execute customer orders; to be then sent or even delivered to customers, also automatically, with autonomous drones and/or cars. The importance of salespersons and networks of physical stores will shrinks; we are close to scenarios where **consumer AI agents negotiate with Retailer AI agents** – based on different objectives, tactics, and strategies.

Even more traditional professions which are built on top of human relationships, such as **legal professions**, will be significantly impacted: typical support services in a legal context, have to do with document handling – classification, discovery, summarization, comparison, knowledge extraction, and management – tasks where AI agents can do a great job already.

Financial Services, **Insurance**, and any other sector requiring a significant amount of data processing and content handling will also benefit from AI. And of course states, governance, and social mechanisms – **AI can have a great role in eliminating bureaucracy**, improving the service to citizens, along with the design and performance of social programs.

In any case, the entire socioeconomic system is entering a phase of accelerating transformation: Markets, businesses, Education, Government, Social Welfare, and employment models will be severely impacted.

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IOT SENSORS

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The Internet of Things (IoT) offers great potential to change the way in which systems function and businesses operate – providing not only a leap in automation but deep visibility driven by the massive amounts of data that can be collected, analyzed, reported, and acted upon – often without the need for human interaction or involvement. IoT sensors are pieces of hardware that detect changes in an environment and collect data. They're the pieces of an IoT ecosystem that bridge the digital world to the physical world. IoT sensors may detect things like temperature, pressure, and motion, and if they are connected to a network, they share data with the network.

The sensor attains a physical parameter and converts it into a signal suitable for processing (e.g. electrical, mechanical, optical) the characteristics of any device or material to detect the presence of a particular physical quantity. The output of the sensor is a signal which is converted to a human-readable form like changes in characteristics, changes in resistance, capacitance, impedance etc.

Industries and organizations have been using various kinds of sensors for a long time but the invention of the Internet of Things has taken the evolution of sensors to a completely different level.

TYPES OF IOT SENSORS:

Proximity sensor: A device that detects the presence or absence of a nearby object, or properties of that object, and converts it into signal which can be easily read by user or a simple electronic instrument without getting in contact with them.

Pressure sensor: A pressure sensor is a device that senses pressure and converts it into an electric signal. Here, the amount depends upon the level of pressure applied.

Temperature sensors: A device, used to measure amount of heat energy that allows to detect a physical change in temperature from a particular source and converts the data for a device or user, is known as a Temperature Sensor.

Chemical sensor: Chemical sensors are applied in a number of different industries. Their goal is to indicate changes in liquid or to find out air chemical changes. They play an important role in bigger cities, where it is necessary to track changes and protect the population.

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DEEP LEARNING IN AI

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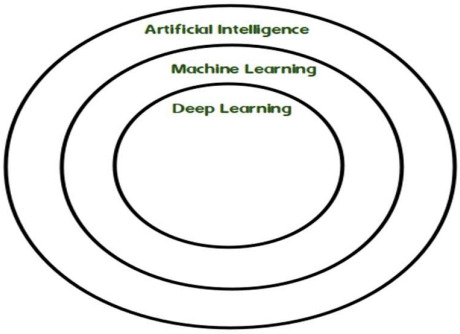
Deep learning is a branch of machine learning which is completely based on artificial neural networks, as neural network is going to mimic the human brain so deep learning is also a kind of mimic of human brain. In deep learning, we don't need to explicitly program everything. As in the last 20 years, the processing power increases exponentially, deep learning and machine learning came in the picture.

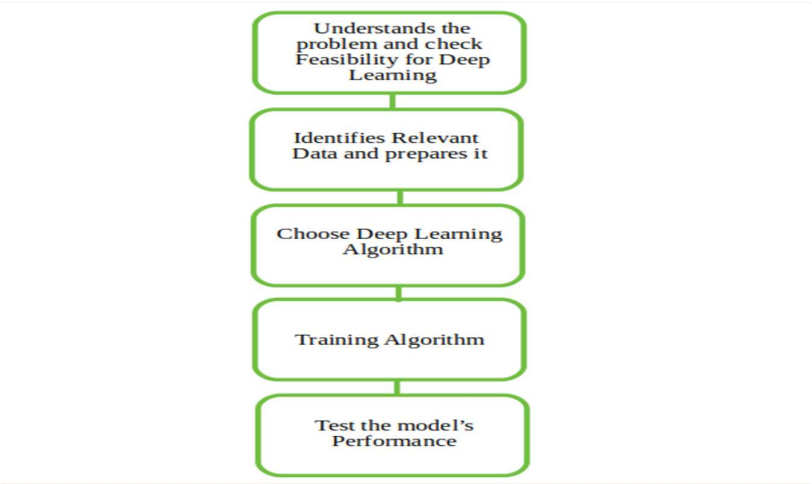
ARCHITECTURES :

1. **Deep Neural Network** – It is a neural network with a certain level of complexity (having multiple hidden layers in between input and output layers). They are capable of modelling and processing non-linear relationships.
2. **Deep Belief Network (DBN)** – It is a class of Deep Neural Network. It is multi-layer belief networks.
   Steps for performing DBN :
   a. Learn a layer of features from visible units using Contrastive Divergence algorithm.
   b. Treat activations of previously trained features as visible units and then learn features of features.
   c. Finally, the whole DBN is trained when the learning for the final hidden layer is achieved.
3. **Recurrent** (perform same task for every element of a sequence) **Neural Network** – Allows for parallel and sequential computation. Similar to the human brain (large feedback network of connected neurons). They are able to remember important things about the input they received and hence enables them to be more precise.



WORKING :

First, we need to identify the actual problem in order to get the right solution and it should be understood, the feasibility of the Deep Learning should also be checked. Second, we need to identify the relevant data which should correspond to the actual problem and should be prepared accordingly. Third, Choose the Deep Learning Algorithm appropriately. Fourth, Algorithm should be used while training the dataset. Fifth, Final testing should be done on the dataset.



ADVANTAGES :

1) Best in-class performance on problems.
2) Reduces need for feature engineering.
3) Eliminates unnecessary costs.
4) Identifies defects easily that are difficult to detect.

DISADVANTAGES :

1) Large amount of data required.
2) Computationally expensive to train.
3) No strong theoretical foundation.

APPLICATIONS :

1. **Automatic Text Generation** – Corpus of text is learned and from this model new text is generated, word-by-word or character-by-character. Then this model is capable of learning how to spell, punctuate, form sentences, or it may even capture the style.
2. **Healthcare** – Helps in diagnosing various diseases and treating it.

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SOCIAL MEDIA MONITORING

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AI in Social Media holds the potential to transform how brands market across platforms like TikTok, Snapchat, Facebook, Instagram, Twitter, and LinkedIn.

AI can read and write using natural language generation and natural language processing. It can detect and mimic tone of voice using sentiment analysis. It can detect images, video, faces using image recognition and computer vision capabilities.

HOW AI IS USED IN SOCIAL MEDIA:

Following top platforms uses AI as follows:

FACEBOOK:

Facebook uses AI to do everything from translate foreign languages to automatically classify images.

The company's AI algorithm predict what content you will engage with most, based on your historical engagement. The platform then server that content to you.

INSTAGRAM:

Instagram uses AI to target ads and serve you interesting content based on what you've engaged with in the past. It also leans on AI to filter out spam, since the platform has problems with spam bots posting comments and content.

TikTok:

TikTok is one of the first social media platforms to be almost entirely governed by AI every video you see on TikTok is directly determined by AI ranking algorithms, optimized to deliver content that keeps you on the app.

TikTok also relies exclusively on AI to initially analyze videos uploaded to platform (though humans may enter the review process later).

YouTube:

A big way YouTube now uses AI is to fight misinformation by identifying and flagging videos trying to spread the conspiracy theories and fake news that have proliferated in recent years.

YouTube also relies on AI to serve you content that it thinks you'll like to watch next.

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NATURAL LANGUAGE PROCESSING

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Natural language processing refers to the branch of computer science—and more specifically, the branch of artificial intelligence or AI—concerned with giving computers the ability to understand text and spoken words in much the same way human beings can. Together, these technologies enable computers to process human language in the form of text or voice data and to 'understand' its full meaning, complete with the speaker or writer's intent and sentiment.

NLP TASKS

Human language is filled with ambiguities that make it incredibly difficult to write software that accurately determines the intended meaning of text or voice data. Several NLP tasks break down human text and voice data in ways that help the computer make sense of what it's ingesting. Speech recognition, also called speech-to-text, is the task of reliably converting voice data into text data.

PYTHON AND THE NATURAL LANGUAGE TOOLKIT

The Python programming language provides a wide range of tools and libraries for attacking specific NLP tasks. Many of these are found in the Natural Language Toolkit, or NLTK, an opensource collection of libraries, programs, and education resources for building NLP programs. Enter statistical NLP, which combines computer algorithms with machine learning and deep learning models to automatically extract, classify, and label elements of text and voice data and then assign a statistical likelihood to each possible meaning of those elements. **NLP USE CASES**

Spam detection is one of a handful of NLP problems that experts consider 'mostly solved'. Truly useful machine translation involves more than replacing words in one language with words of another. Effective translation has to capture accurately the meaning and tone of the input language and translate it to text with the same meaning and desired impact in the output language.

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RADIOLOGY IN ARTIFICIAL INTELLIGENCE

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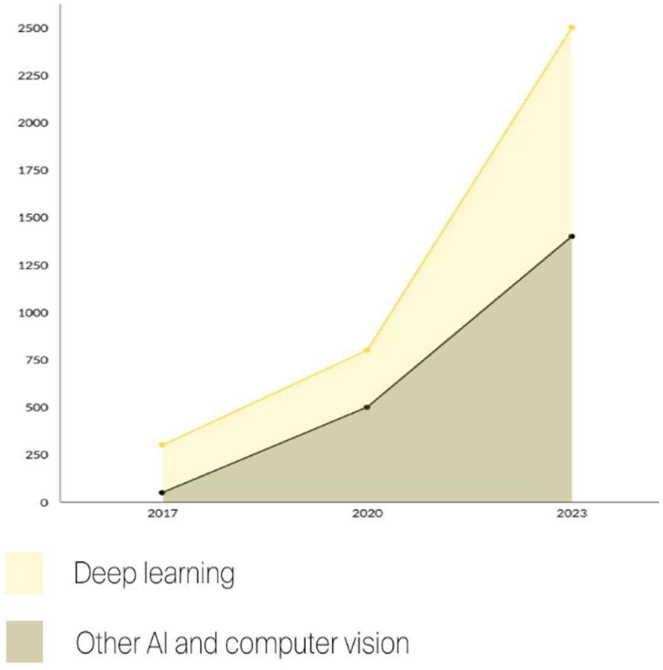
Artificial intelligence (AI) algorithms, particularly deep learning, have demonstrated remarkable progress in image-recognition tasks. Methods ranging from convolutional neural networks to variational autoencoders have found myriad applications in the medical image analysis field, propelling it forward at a rapid pace. Historically, in radiology practice, trained physicians visually assessed medical images for the detection, characterization and monitoring of diseases. AI methods excel at automatically recognizing complex patterns in imaging data and providing quantitative, rather than qualitative, assessments of radiographic characteristics. In this Opinion article, establishing a general understanding of AI methods, particularly those pertaining to image-based tasks.

WHAT IS AI AND HOW IT IS USED IN RADIOLOGY?

Artificial intelligence is a field of science that pursues the goal of creating intelligent applications and machines that can mimic human cognitive functions, such as learning and problem-solving. Machine learning (ML) and deep learning (DL) are subsets of AI.

Machine learning implies training algorithms to solve tasks independently using pattern recognition. For example, researchers can apply ML algorithms to radiology by training them to recognize pneumonia in lung scans.

Deep learning solutions rely on neural networks with artificial neurons modeled after a human brain. These networks have multiple hidden layers and can derive more insights than linear algorithms. Deep learning algorithms are widely used to reconstruct medical images and enhance their quality. As presented in the graph below, deep learning is gaining popularity in radiology. This AI subset has proven to be more efficient in handling medical data and extracting useful insights.



TWO WAYS OF USING AI IN RADIOLOGY:

1. Programming an algorithm with predefined criteria supplied by experienced radiologists. These rules are hardwired into the software and enable it to perform straightforward clinical tasks.
2. Letting an algorithm learn from large volumes of data with either supervised/unsupervised techniques. The algorithm extracts patterns by itself and can come up with insights that escaped the human eye.

TOP 5 APPLICATIONS IN AI:

1. Classifying brain tumours
2. Detecting hidden fractures
3. Recognizing breast cancer
4. Detecting neurological abnormalities
5. Offering a second opinion

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DECISION-MAKING IN ARTIFICIAL INTELLIGENCE

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Artificial Intelligence and Decision-making combines intellectual traditions from across computer science and electrical engineering to develop techniques for the analysis and synthesis of systems that interact with an external world via perception, communication, and action; while also learning, making decisions and adapting to a changing environment.

WHAT CHALLENGES ARE THERE WITH TRUSTING AI DECISIONS?

1. Human values

As AI becomes more capable, the concern about whether humans can trust its "human values" grows. People were excited about the idea of autonomous cars until their decision-making process was brought into question how autonomous cars could deal with challenging and complex situations.

Transparency is vital to trust. And until things are fully transparent, there will always be trust issues, and that's how it has always been in organizations and businesses.

Another one aims to make their AI machines more like trusted partners to assess their performance and give accurate reports on the conditions that they do or do not do well.

2. ACCURACY AUTONOMY

AI makes decisions based on the predictions they have. In most cases, AI systems' decisions are accurate enough when 95% or higher. That's impressive and indeed good enough for essential daily AI uses, but that would be entirely different when it's for high-stake situations. Should machines be given high-stake autonomy?

5 APPLICATIONS OF AI IN DECISION MAKING

1. DECISIONS IN BUSINESS OPERATIONS

Machine Learning algorithms come to the rescue in areas built on a constant flow of heterogeneous data, whether it is several financial reports, payrolls, procurement, the analysis of employee productivity, or predicting further churn rates.

2. COMPLEX PROBLEM-SOLVING

The potential of AI in decision making is robust, but you can solve multilayer and complex problems, too. For this, you must remember that AI solutions depend on the data you have and the step-by-step process orchestration.

3. STRATEGIC CHANGES

AI allows better planning of production, managing all restrictions, reducing shortcomings in operations, and improving manufacturing.

It also helps to anticipate and adequately plan product customization, enhance postponement processes, and maintain efficiency with high levels of customer satisfaction. Besides, go-to-market and marketing strategies must be flexible due to the current competitive environment and market dynamics. AI can make those changes in strategy quicker and less harmful.

4. CUSTOMER-RELATED DECISIONS

AI can be valuable for customer service management, personalized customer communication, evaluation of customer behavior, predicting consumer trends and patterns.

5. Performance assessment

Firstly, it relates to people's performance evaluation and afterward decisions. The employee performance review process is moving from every 6 or 12 months to ongoing. Despite this, the integrity of the employee evaluation process can be undermined by human error and potential biases. AI is capable of minimizing human errors and making employee performance data more transparent.

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ARTIFICIAL INTELLIGENCE WITH QUANTUM COMPUTING

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WHAT IS QUANTUM COMPUTING?

Quantum Computing is style of computing that relies on the principles of quantum mechanics to function. In classical computing, data is encoded in bits that can be either 1 or 0. Quantum Computing uses qubits that can be both 1 and 0 simultaneously. This allows many calculations to be done simultaneously, so quantum computing is powerful. It's also why it's seen as the future of artificial intelligence and data science.

ADVANTAGES:

 Faster Computation: Quantum computers have computation power higher than supercomputers also. They can process data 1000 times faster than normal computer can take 1000 years is done by quantum computers in a few seconds.

 Best for simulation: Quantum Computers are best for doing data simulation computing. There are many algorithms created that can simulated various things like weather forecasting, chemical simulation etc.

DISADVANTAGES:

 Algorithm creation: For every type of computation, it needs to write a new algorithm. Quantum computing cannot work as classical computers, they need special algorithms to perform tasks in their environment.

 Internet Security: It is assumed by the scientists that if quantum computer is implemented in the best way, then whole internet security breaks. This is due to the facts that these computers can decrypt all the codes of the internet.

WHY IS QUANTUM COMPUTING THE FUTURE OF AI?

In classical computing, bits are either 1 or 0. However, a quantum bit or qubit can be simultaneously 1 or 0 in quantum computing, which opens up a new realm of possibilities for computing power. Quantum computers can crack problems much quicker than classical computers because they can try several solutions simultaneously. They're also not constrained by the same limitations as classical computers, meaning they can solve currently impossible problems.

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KNOWLEDGE-BASED SYSTEMS

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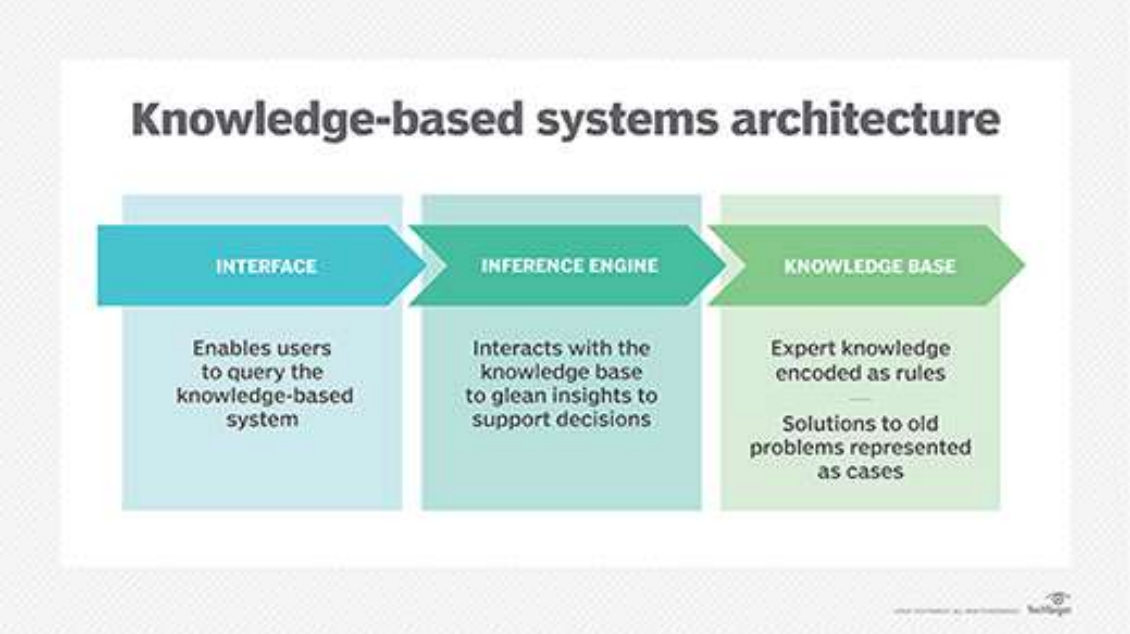
A knowledge-based system (KBS) is a form of artificial intelligence (AI) that aims to capture the knowledge of human experts to support decision-making. Examples of knowledge-based systems include expert systems, which are so called because of their reliance on human expertise.

A knowledge-based system may vary with respect to its problem-solving method or approach. Some systems encode expert knowledge as rules and are therefore referred to as rule-based systems. Another approach, case-based reasoning, substitutes cases for rules. Cases are essentially solutions to existing problems that a case-based system will attempt to apply to a new problem.



Where knowledge-based systems are used

Over the years, knowledge-based systems have been developed for a number of applications. MYCIN, for example, was an early knowledge-based system created to help doctors diagnose diseases. Healthcare has remained an important market for knowledge-based systems, which are now referred to as clinical decision support systems in the health sciences context.

Knowledge-based systems and artificial intelligence

While a subset of artificial intelligence, classical knowledge-based systems differ in approach to some of the newer developments in AI.

Daniel Dennett, a philosopher and cognitive scientist, in his 2017 book, *From Bacteria to* Bach and Back, cited a strategy shift from early AI, characterized by "top-down-organized, bureaucratically efficient know-it-all" systems to systems that harness Big Data and "statistical pattern-finding techniques" such as data-mining and deep learning in a more bottom-up approach.

Examples of AI following the latter approach include neural network systems, a type of deep-learning technology that concentrates on signal processing and pattern recognition problems such as facial recognition.

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AI WITH BIG DATA?

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AI makes big data analytics simpler by automating and enhancing data preparation, data visualization, predictive modelling, and other complex analytical tasks that would otherwise be labour-intensive and time-consuming. AI helps users work with, manipulate, and surface actionable insights faster from large, complex datasets.

The world was entrenched in big data before it even realized that big data existed. By the time the term was coined, big data had accumulated a massive amount of stored information that, if analysed properly, could reveal valuable insights into the industry to which that particular data belonged.

IT professionals and computer scientists quickly realized the job of sifting through all of that data, parsing it (converting it into a format more easily understood by a computer), and analysing it to improve business decision-making processes was too much for human minds to tackle. Artificially intelligent algorithms would have to be written to accomplish the enormous task of deriving insight out of complex data.

HOW AI IS USED IN BIG DATA

The internet now provides a level of concrete information about consumer habits, likes and dislikes, activities, and personal preferences that was impossible a decade ago. Social media accounts and online profiles, social activity, product reviews, tagged interests, "liked" and shared content, loyalty/rewards apps and programs, and CRM (customer relationship management) systems all add potentially insightful data to the big data pool.

COLLECTING CONSUMER INFORMATION

Regardless of the industry, one of AI's greatest assets is its learning ability. Its capacity to recognize data trends is only useful if it can adapt to changes and fluctuations in those trends. Through identifying outliers in the data, AI knows what pieces of customer feedback are considered significant and can adjust as necessary.

BUSINESS ANALYTICS

According to Forbes, the most recent research indicates that a combination of AI and big data can automate nearly 80% of all physical work, 70% of data processing work, and 64% of data collection tasks. This suggests that the two concepts have the potential to tremendously affect the workplace, in addition to their contributions to marketing and business efforts..

THE MELDING OF AI AND BIG DATA

AI and big data can work together to achieve more. First, data is fed into the AI engine, making the AI smarter. Next, less human intervention is needed for the AI to run properly. And finally, the less AI needs people to run it, the closer society comes to realizing the full potential of this ongoing AI/big data cycle.

That evolution will require the involvement of human beings who are trained in data analytics and AI algorithm programming.

According to software company Xenon Stack, the ultimate goals of AI are as follows:

- Reasoning
- Automated learning and scheduling
- Machine learning

- Natural language processing (the ability to understand human speech as it is spoken)
- Computer vision (the ability to extract accurate information from an image or series of images)
- Robotics
- General intelligence

For these AI fields to mature, their AI algorithms will require massive amounts of data. Natural language processing, for example, will not be possible without millions of samplings of human speech, recorded and broken down into a format that AI engines can more easily process.

Big data will continue to grow larger as AI becomes a more viable option for automating more tasks — and AI will become a larger field as more data is available for learning and analysis.

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AI RECOMMENDATION SYSTEM

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A recommendation engine or system is a tool that developers use to foresee your choices in a long list of suggested items.

Recommendation systems use AI to analyse user interactions and suggest products specific to each user, based on their data. In other words, recommendation engines yield quick and accurate recommendations that are suited to every customer's preference and needs.

There are primarily three techniques for recommendation systems namely,

- Content-based filtering
- Collaborative filtering
- Knowledge-based system

There are four steps involved in making an AI recommendation system:

- **DATA COLLECTION:**

Data of the user like location, age, website click times, liked products, reviews and ratings are stored independently by a platform.

- **DATA LABELLING:**

For building reliable recommendation systems, we need to ensure that the data collected is properly labelled.

- **DATA STORAGE**:

Data related to a user needs to be stored in the database so it can be used to make recommendations for the user.

- **DATA ANALYSIS:**

Data analysis can take place in batch, real-time or near real time. Using data analysis algorithms, similar products are suggested to the users depending on their engagement.

- **DATA FILTERING:**

The last step filters down various products on the basis of the user engagement.

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COMPUTER VISION IN ARTIFICIAL INTELLIGENCE

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Computer vision is a field of artificial intelligence (AI) that enables computers and systems to derive meaningful information from digital images, videos and other visual inputs — and take actions or make recommendations based on that information. If AI enables computers to think, computer vision enables them to see, observe and understand.

Computer vision works much the same as human vision, except humans have a head start. Human sight has the advantage of lifetimes of context to train how to tell objects apart, how far away they are, whether they are moving and whether there is something wrong in an image.

Computer vision trains machines to perform these functions, but it has to do it in much less time with cameras, data and algorithms rather than retinas, optic nerves and a visual cortex. Because a system trained to inspect products or watch a production asset can analyze thousands of products or processes a minute, noticing imperceptible defects or issues, it can quickly surpass human capabilities.

Computer vision needs lots of data. It runs analyses of data over and over until it discerns distinctions and ultimately recognize images. For example, to train a computer to recognize automobile tires, it needs to be fed vast quantities of tire images and tire-related items to learn the differences and recognize a tire, especially one with no defects.

Two essential technologies are used to accomplish this: a type of machine learning called deep learning and a convolutional neural network (CNN).

Few examples of established computer vision tasks:

- **Image classification** sees an image and can classify it (a dog, an apple, a person's face). More precisely, it is able to accurately predict that a given image belongs to a certain class. For example, a social media company might want to use it to automatically identify and segregate objectionable images uploaded by users.
- **Object detection** can use image classification to identify a certain class of image and then detect and tabulate their appearance in an image or video. Examples include detecting damages on an assembly line or identifying machinery that requires maintenance.

COMPUTER VISION APPLICATIONS

- IBM used computer vision to create My Moments for the 2018 Masters golf tournament. IBM Watson watched hundreds of hours of Masters footage and could identify the sights (and sounds) of significant shots. It curated these key moments and delivered them to fans as personalized highlight reels.
- Google Translate lets users point a smartphone camera at a sign in another language and almost immediately obtain a translation of the sign in their preferred language.
- The development of self-driving vehicles relies on computer vision to make sense of the visual input from a car's cameras and other sensors. It's essential to identify other cars, traffic signs, lane markers, pedestrians, bicycles and all of the other visual information encountered on the road.
- IBM is applying computer vision technology with partners like Verizon to bring intelligent AI to the edge, and to help automotive manufacturers identify quality defects before a vehicle leaves the factory.

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ARGUMENTATION IN ARTIFICIAL INTELLIGENCE

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ABSTRACT

Over the last ten years, argumentation has come to be increasingly central as a core study within Artificial Intelligence (AI). The articles forming this volume reflect a variety of important trends, developments, and applications covering a range of current topics relating to the theory and applications of argumentation. Our aims in this introduction are, firstly, to place these contributions in the context of the historical foundations of argumentation in AI and, subsequently, to discuss a number of themes that have emerged in recent years resulting in a significant broadening of the areas in which argumentation based methods are used.

INTRODUCTION

In its classical treatment within philosophy, the study of argumentation may, informally, be considered as concerned with how assertions are proposed, discussed, and resolved in the context of issues upon which several diverging opinions may be held. Thus philosophical investigations of argumentation, from Aristotle to the present day, have addressed such themes as: the mechanisms by which “legitimate” argumentation in support of a claim may be

distinguished from “flawed” argumentation; analyses of the typical structures that constitute argument components and argumentation development; the processes by which participants engaging in debate may advance their respective positions and undermine contrary stances and arguments, etc., and the contexts in which these questions are decided.

Within the simplified overview of argumentation outlined in the preceding paragraph, one can, already, identify a number of themes whose elements embody issues of a computational nature in the following:

• Defining the component parts of an argument and their interaction.

• Identifying rules and protocols describing argumentation processes.

• Distinguishing legitimate from invalid arguments.

• Determining conditions under which further discussion is redundant.

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SUPERCOMPUTING IN AI

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AI supercomputing is when organizations use ultrafast processors made up of hundreds of thousands of powerful machines to manage and interpret vast quantities of data using artificial intelligence (AI) models.

supercomputers are often used to run artificial intelligence programs, supercomputing has become synonymous with AI. This regular use is because AI programs require high-performance computing that supercomputers offer. In other words, supercomputers can handle the types of workloads typically needed for AI applications.

Supercomputing evolved over many years since the Colossus machine was put into operation at Bletchley Park in the 1940s. The Colossus was the first functional, electronic, digital computer designed by Tommy Flowers, a General Post Office (GPO) research telephone engineer.

Supercomputing is measured in floating-point operations per second (FLOPS). Petaflops are a measure of a computer's processing speed equal to a thousand trillion flops. And a 1-petaflop

computer system can perform one quadrillion (1015) flops. From a different perspective, supercomputers can be one million times more processing power than the fastest laptop.

The term supercomputer came into use in the early 1960s, when IBM rolled out the IBM 7030 Stretch, and Sperry Rand unveiled the UNIVAC LARC, the first two intentional supercomputers designed to be more powerful than the fastest commercial machines available at the time. Events that influenced the progress of supercomputing began in the late 1950s when the US government began regularly funding the development of cutting-edge, high-performance computer technology for military applications.

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COGNITIVE SYSTEM

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The term cognitive computing is typically used to describe AI system that is simulate human thought. Human Cognition involves real-time environment, analysis of the real world environment, context, intent and many other variables that inform a person's ability to solve system.

Cognitive computing is the uses of computerized models to simulate the human thought process in complex situation . where the answer may be ambiguous and uncertain ,The phrase is closely associated with IBM's cognitive computer system.

Computer are faster the humans at processing and calculating , but they have at yet to process some task such as understanding natural language and recognizing object in an image .cognitive computing is an attempt to have computer the way a brain works.

FEATURES OF COGNITIVE SYSTEM:-

***ADAPTIVE**:-This is the first step in making a machine learning based on cognitive system.

***INTERACTIVE**:-Similar to brain the cognitive solution must interaction with all elements in the system, processor, device ,cloud services and user.

***ITERACTIVE AND STATEFU**L:-Cognitive computing technologies can ask question and pull in additional to identify or clarity a problem.

***CONTEXTUAL**:-Understanding context is critical in thought processes.

BENEFITS OF COGNITIVE SYSTEM:-

Cognitive computing can analysis emerging patterns ,spots business opportunities and take care of critical process centric issues in real time. By examining a vast amount of data,A cognitive computing system such as Watson can simplify processes, reduce risk and pivot according to change circumstances.

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