WHAT IS ARTIFICIAL INTELLIGENCE

INTRODUCTION TO AI | AI6310



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WHAT IS AI?

Artificial intelligence (AI) is technology that enables computers and machines to simulate human learning, comprehension, problem solving, decision making, creativity and autonomy.





INTRO TO AI ARTIFICIAL INTELLIGENCE

Applications and devices equipped with AI can see and identify objects. They can understand and respond to human language. They can learn from new information and experience. They can make detailed recommendations to users and experts. They can act independently, replacing the need for human intelligence or intervention (a classic example being a self-driving car).











ARTIFICIAL INTELLIGENCE

WEAK AI (Narrow AI)

Weak AI refers to AI systems that are designed to perform specific tasks and are limited to those tasks only. These AI systems excel at their designated functions but lack general intelligence. Examples of weak AI include voice assistants like Siri or Alexa, recommendation algorithms, and image recognition systems. Weak AI operates within predefined boundaries and cannot generalize beyond their specialized domain.

STRONG AI (General AI)

Strong AI, also known as general AI, refers to AI systems that possess human-level intelligence or even surpass human intelligence across a wide range of tasks. Strong AI would be capable of understanding, reasoning, learning, and applying knowledge to solve complex problems in a manner similar to human cognition. However, the development of strong AI is still largely theoretical and has not been achieved to date.



TYPES OF ARTIFICIAL INTELLIGENCE PURELY REACTIVE

These machines do not have any memory or data to work with, specializing in just one field of work. For example, in a chess game, the machine observes the moves and makes the best possible decision to win.









TYPES OF ARTIFICIAL INTELLIGENCE LIMITED MEMORY

These machines collect previous data and continue adding it to their memory. They have enough memory or experience to make proper decisions, but memory is minimal. For example, this machine can suggest a restaurant based on the location data that has been gathered.









TYPES OF ARTIFICIAL INTELLIGENCE THEORY OF MIND

This kind of AI can understand thoughts and emotions, as well as interact socially. However, a machine based on this type is yet to be built.





TYPES OF ARTIFICIAL INTELLIGENCE SELF-AWARE

Self-aware machines are the future generation of these <u>new technologies</u>. They will be intelligent, sentient, and conscious.









ARTIFICIAL INTELLIGENCE ADVANTAGES AND DISADVANTAGES OF AI

Pros

- It reduces human error
- It never sleeps, so it's available 24x7
- It never gets bored, so it easily handles repetitive tasks
- It's fast

Cons

- It's costly to implement
- It can't duplicate human creativity
- It will definitely replace some jobs, leading to unemployment
- People can become overly reliant on it





APPLICATIONS OF ARTIFICIAL INTELLIGENCE NATURAL LANGUAGE PROCESSING (NLP)

Al is used in NLP to analyze and understand human language. It powers applications such as speech recognition, machine translation, sentiment analysis, and virtual assistants like Siri and Alexa.

IMAGE AND VIDEO ANALYSIS

Al techniques, including computer vision, enable the analysis and interpretation of images and videos. This finds application in facial recognition, object detection and tracking, content moderation, medical imaging, and autonomous vehicles.









APPLICATIONS OF ARTIFICIAL INTELLIGENCE ROBOTICS AND AUTOMATION

Al plays a crucial role in robotics and automation systems. Robots equipped with Al algorithms can perform complex tasks in manufacturing, healthcare, logistics, and exploration. They can adapt to changing environments, learn from experience, and collaborate with humans.

RECOMMENDATION SYSTEMS

Al-powered recommendation systems are used in e-commerce, streaming platforms, and social media to personalize user experiences. They analyze user preferences, behavior, and historical data to suggest relevant products, movies, music, or content.







APPLICATIONS OF ARTIFICIAL INTELLIGENCE FINANCIAL SERVICES

Al is extensively used in the finance industry for fraud detection, algorithmic trading, credit scoring, and risk assessment. Machine learning models can analyze vast amounts of financial data to identify patterns and make predictions.

HEALTHCARE

Al applications in healthcare include disease diagnosis, medical imaging analysis, drug discovery, personalized medicine, and patient monitoring. Al can assist in identifying patterns in medical data and provide insights for better diagnosis and treatment.





APPLICATIONS OF ARTIFICIAL INTELLIGENCE VIRTUAL ASSISTANTS AND CHATBOTS

Al-powered virtual assistants and chatbots interact with users, understand their queries, and provide relevant information or perform tasks. They are used in customer support, information retrieval, and personalized assistance.

GAMING

Al algorithms are employed in gaming for creating realistic virtual characters, opponent behavior, and intelligent decision-making. Al is also used to optimize game graphics, physics simulations, and game testing.







APPLICATIONS OF ARTIFICIAL INTELLIGENCE SMART HOMES AND IOT

Al enables the development of smart home systems that can automate tasks, control devices, and learn from user preferences. Al can enhance the functionality and efficiency of Internet of Things (IoT) devices and networks.

CYBERSECURITY

AI helps detect and prevent cyber threats by analyzing network traffic, identifying anomalies, and predicting potential attacks. It can also enhance the security of systems and data through advanced threat detection and response mechanisms.







ARTIFICIAL INTELLIGENCE EXAMPLES CHATGPT

ChatGPT is an advanced language model developed by OpenAI. It can generate human-like responses and engage in natural language conversations. It uses deep learning techniques to understand and generate coherent text, making it useful for customer support, chatbots, and virtual assistants.

GOOGLE MAPS

Google Maps utilizes AI algorithms to provide real-time navigation, traffic updates, and personalized recommendations. It analyzes vast amounts of data, including historical traffic patterns and user input, to suggest the fastest routes, estimate arrival times, and even predict traffic congestion.







ARTIFICIAL INTELLIGENCE EXAMPLES SMART ASSISTANTS

Smart assistants like Amazon's Alexa, Apple's Siri, and Google Assistant employ Al technologies to interpret voice commands, answer questions, and perform tasks. These assistants use natural language processing and machine learning algorithms to understand user intent, retrieve relevant information, and carry out requested actions.

SNAPCHAT FILTERS

Snapchat's augmented reality filters, or "Lenses," incorporate AI to recognize facial features, track movements, and overlay interactive effects on users' faces in real-time. AI algorithms enable Snapchat to apply various filters, masks, and animations that align with the user's facial expressions and movements.





ARTIFICIAL INTELLIGENCE EXAMPLES SELF-DRIVING CARS

Self-driving cars rely heavily on AI for perception, decision-making, and control. Using a combination of sensors, cameras, and machine learning algorithms, these vehicles can detect objects, interpret traffic signs, and navigate complex road conditions autonomously, enhancing safety and efficiency on the roads.

WEARABLES

Wearable devices, such as fitness trackers and smartwatches, utilize AI to monitor and analyze users' health data. They track activities, heart rate, sleep patterns, and more, providing personalized insights and recommendations to improve overall well-being.





INTRO TO AI MACHINE LEARNING

	1950's	K Artificial intelligence (AI) Human intelligence exhibited by machines				
		1980's	Machine learning AI systems that learn from historical data			
			2010's	Deep learning Machine learning models that mimic human brain function		
				2020's	AT Generative AI (Gen AI) Deep learning models (foundation models) that create original content	





INTRO TO AI MACHINE LEARNING

Directly underneath AI, we have machine learning, which involves creating <u>models</u> by training an algorithm to make predictions or decisions based on data. It encompasses a broad range of techniques that enable computers to learn from and make inferences based on data without being explicitly programmed for specific tasks.











TYPES OF MACHINE LEARNING SUPERVISED MACHINE LEARNING

<u>Supervised learning</u> is defined as when a model gets trained on a "Labelled Dataset". Labelled datasets have both input and output parameters. In Supervised Learning algorithms learn to map points between inputs and correct outputs. It has both training and validation datasets labelled.







CATEGORIES OF SUPERVISED LEARNING CLASSIFICATION

Classification deals with predicting categorical target variables, which represent discrete classes or labels. For instance, classifying emails as spam or not spam, or predicting whether a patient has a high risk of heart disease. Classification algorithms learn to map the input features to one of the predefined classes.

REGRESSION

<u>Regression</u>, on the other hand, deals with predicting continuous target variables, which represent numerical values. For example, predicting the price of a house based on its size, location, and amenities, or forecasting the sales of a product. Regression algorithms learn to map the input features to a continuous numerical value.





TYPES OF MACHINE LEARNING SUPERVISED MACHINE LEARNING

Advantages of Supervised Machine Learning

- Supervised Learning models can have high accuracy as they are trained on labelled data.
- The process of decision-making in supervised learning models is often interpretable.
- It can often be used in pre-trained models which saves time and resources when developing new models from scratch.

Disadvantages of Supervised Machine Learning

- It has limitations in knowing patterns and may struggle with unseen or unexpected patterns that are not present in the training data.
- It can be time-consuming and costly as it relies on labeled data only.
- It may lead to poor generalizations based on new data.





TYPES OF MACHINE LEARNING UNSUPERVISED MACHINE LEARNING

Unsupervised learning is a type of machine learning technique in which an algorithm discovers patterns and relationships using unlabeled data. Unlike supervised learning, unsupervised learning doesn't involve providing the algorithm with labeled target outputs. The primary goal of Unsupervised learning is often to discover hidden patterns, similarities, or clusters within the data, which can then be used for various purposes, such as data exploration, visualization, dimensionality reduction, and more.





CATEGORIES OF UNSUPERVISED LEARNING

CLUSTERING

<u>Clustering</u> is the process of grouping data points into clusters based on their similarity. This technique is useful for identifying patterns and relationships in data without the need for labeled examples.

ASSOCIATION

Association rule learning is a technique for discovering relationships between items in a dataset. It identifies rules that indicate the presence of one item implies the presence of another item with a specific probability.





TYPES OF MACHINE LEARNING UNSUPERVISED MACHINE LEARNING

Advantages of Unsupervised Machine Learning

- It helps to discover hidden patterns and various relationships between the data.
- Used for tasks such as customer segmentation, anomaly detection, and data exploration.
- It does not require labeled data and reduces the effort of data labeling.

Disadvantages of Unsupervised Machine Learning

- Without using labels, it may be difficult to predict the quality of the model's output.
- Cluster Interpretability may not be clear and may not have meaningful interpretations.
- It has techniques such as <u>autoencoders</u> and <u>dimensionality reduction</u> that can be used to extract meaningful features from raw data.





