Unit -1 Introdution to AI

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Introduction to AI

- **Artificial Intelligence (AI)** refers to the simulation of human intelligence in machines. These machines are designed to perform tasks that typically require human cognition, such as understanding language, recognizing patterns, solving problems, and making decisions.

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

Brief History of AI

- **Pre-20th Century: Early Ideas**

Ancient myths & philosophy: Concepts of intelligent machines and artificial beings appear in myths (e.g., Pygmalion) and philosophical texts (e.g., Aristotle's logic).

17th-19th centuries: Thinkers like **René Descartes**, **Leibniz**, and **Charles Babbage** imagined mechanical reasoning and computation.

Brief History of AI

- **20th Century: Birth of AI**
- **1940s–1950s: Foundations**
- **1943** – McCulloch & Pitts model artificial neurons.
- **1950** – Alan Turing proposes the **Turing Test** in *"Computing Machinery and Intelligence."*
- **1956** – The **Dartmouth Conference** (by John McCarthy, Marvin Minsky, Claude Shannon, and others) coins the term "**Artificial Intelligence**."

Brief History of AI

- **Birth of AI as a Field (1940s-1950s)**
- **Turing (1936):** British mathematician **Alan Turing** proposed the idea of a machine that could simulate human thought, introducing the famous **Turing Test** (1950).
- **Dartmouth Conference (1956): John McCarthy** and others officially coined the term "Artificial Intelligence" and launched the field at this pivotal conference.

Brief History of AI

- **Early AI Development (1960s-1970s)**
- **Expert Systems (1960s-70s):** Programs like **MYCIN** in medicine and **DENDRAL** in chemistry aimed to mimic expert-level decision-making.
- **AI Winter (1970s):** Early optimism waned due to limitations in technology and AI's inability to scale effectively, leading to a decrease in funding.

Brief History of AI

- **Revival & Growth (1980s-1990s)**
- **Expert Systems Boom (1980s):** AI regained attention through expert systems used in various industries.
- **Deep Blue (1997):** IBM's **Deep Blue** defeated world chess champion **Garry Kasparov**, marking a milestone for AI in specialized tasks.

Brief History of AI

- **Modern AI (2000s-Present)**
- **Big Data & Machine Learning (2000s):** AI became more practical with access to massive datasets and computational power, leading to rapid advancements in machine learning.
- **Deep Learning (2010s): Deep neural networks** revolutionized fields like image and speech recognition.
- **Generative AI (2020s):** Models like **GPT-3** and **DALL·E** introduced powerful AI that can generate text, images, and more, marking a new era in creativity and natural language processing.

Application of AI

- **Healthcare**
- **Medical Imaging**: AI is used to analyze X-rays, MRIs, and other imaging techniques to detect conditions like cancer, heart disease, and brain disorders.
- **Predictive Analytics**: AI models predict disease outbreaks, patient deterioration, and help in early diagnosis.
- **Robotic Surgery**: AI-powered robots assist surgeons in performing precise and minimally invasive surgeries.
- **Drug Discovery**: AI accelerates drug development by predicting molecular interactions and optimizing clinical trial designs.

Application of AI

- **Finance**
- **Fraud Detection**: AI systems analyze financial transactions in real time to detect fraudulent behavior.
- **Algorithmic Trading**: AI models predict market trends and make high-speed trades, often outperforming human traders.
- **Credit Scoring**: AI algorithms evaluate creditworthiness by analyzing various data points beyond traditional credit scores.
- **Customer Service**: Chatbots and virtual assistants provide 24/7 customer support for banking services.

Application of AI

- **Transportation**
- **Autonomous Vehicles**: Self-driving cars, trucks, and drones rely heavily on AI to navigate, recognize obstacles, and make real-time decisions.
- **Traffic Management**: AI systems analyze traffic patterns to optimize traffic lights and reduce congestion.
- **Route Optimization**: AI applications help logistics companies find the most efficient delivery routes.

Application of AI

- **Education**
- **Personalized Learning**: AI tools tailor learning experiences to the pace and style of each student.
- **Automated Grading**: AI can grade assignments, quiz and exams, saving educators time.
- **Tutoring Systems**: AI-based tutors help students with homework, providing explanations and guidance on specific topics.

Application of AI

- **Human Resources**
- **Recruitment**: AI tools scan resumes and conduct initial candidate screening, matching applicants with job roles based on their skills and experience.
- **Employee Sentiment Analysis**: AI analyzes employee feedback to gauge satisfaction, productivity, and morale.
- **Training**: AI-based platforms create personalized training programs for employees.

Ethical Consideration of AI

Bias and Fairness

- **Problem**: AI can inherit or amplify biases present in training data.
- **Example**: Facial recognition systems performing worse on people with darker skin tones.
- **Ethical Concern**: Discrimination and unfair treatment of individuals or groups.

Ethical Consideration of AI

Privacy

- **Problem**: AI often requires large amounts of personal data.
- **Example**: Predictive algorithms used by social media or surveillance tools.
- **Ethical Concern**: Loss of privacy, unauthorized data usage, surveillance risks.

Ethical Consideration of AI

Job Displacement

- **Problem**: Automation can replace human labor.
- **Example**: AI used in logistics, customer service, and content creation.
- **Ethical Concern**: Economic inequality and social disruption.

Ethical Consideration of AI

Security and Misuse

- **Problem**: AI can be weaponized or used in cyberattacks.
- **Example**: Autonomous weapons or AI-powered phishing scams.
- **Ethical Concern**: Global instability, harm to civilians, cyber warfare.

Ethical Consideration of AI

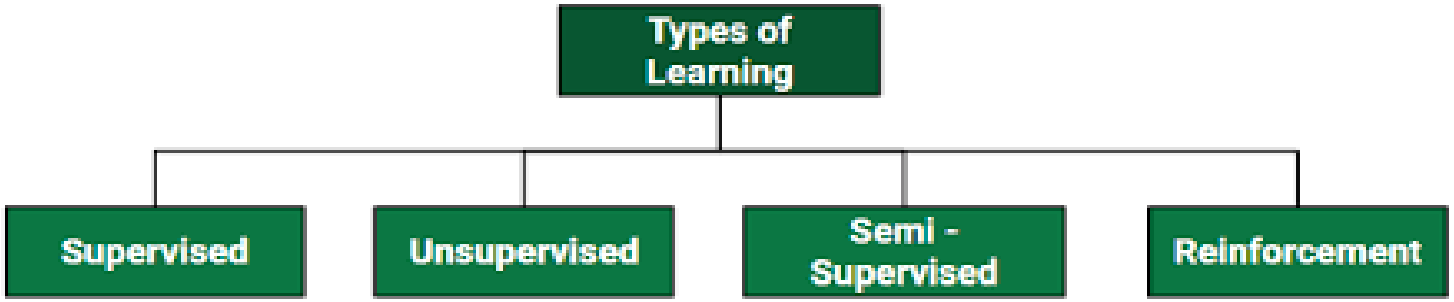
- **Environmental Impact**
- **Issue**: Training large AI models consumes significant energy.
- **Ethical Concern**: Contribution to climate change and resource depletion.
- **Principle**: Promote sustainable AI development practices.

Overview of AI Technologies and techniques

- Artificial Intelligence (AI) refers to developing computer systems for performing tasks requiring human intelligence.
- These systems assess large amounts of data to identify patterns and make logical decisions based on the collected information.
- The ultimate goal of AI is to create machines to carry out diverse tasks.
- Machine Learning.
- Natural Language Processing.
- Computer Vision.
- Deep Learning
- Data Mining

Overview of AI Technologies and techniques

- **1.Machine learning:**
- This approach involves the building of algorithms to learn patterns in data and make predictions based on it.



Overview of AI Technologies and techniques

- **1. <u>Unsupervised machine learning</u>** -AI systems analyse unlabelled data, where no predefined outcomes are provided.
- The objective is to uncover inherent structures or patterns within the data without any prior knowledge.
- For instance, it can group similar customer behavior data to identify customer segments for targeted marketing strategies.

Overview of AI Technologies and techniques

- **2. <u>Supervised learning</u>** - A combination of an input data set and the intended output is inferred from the training data. AI systems learn from a labeled dataset,
- where each data point is associated with a known outcome.
- For instance, it enables email spam filters to distinguish between spam and legitimate emails based on learned patterns.

Overview of AI Technologies and techniques

- **3. Semi-supervised learning** - It is a method that uses a small amount of labelled data and a large amount of unlabelled data to train a model.
- The goal of semi-supervised learning is to learn a function that can accurately predict the output variable based on the input variables, similar to supervised learning.

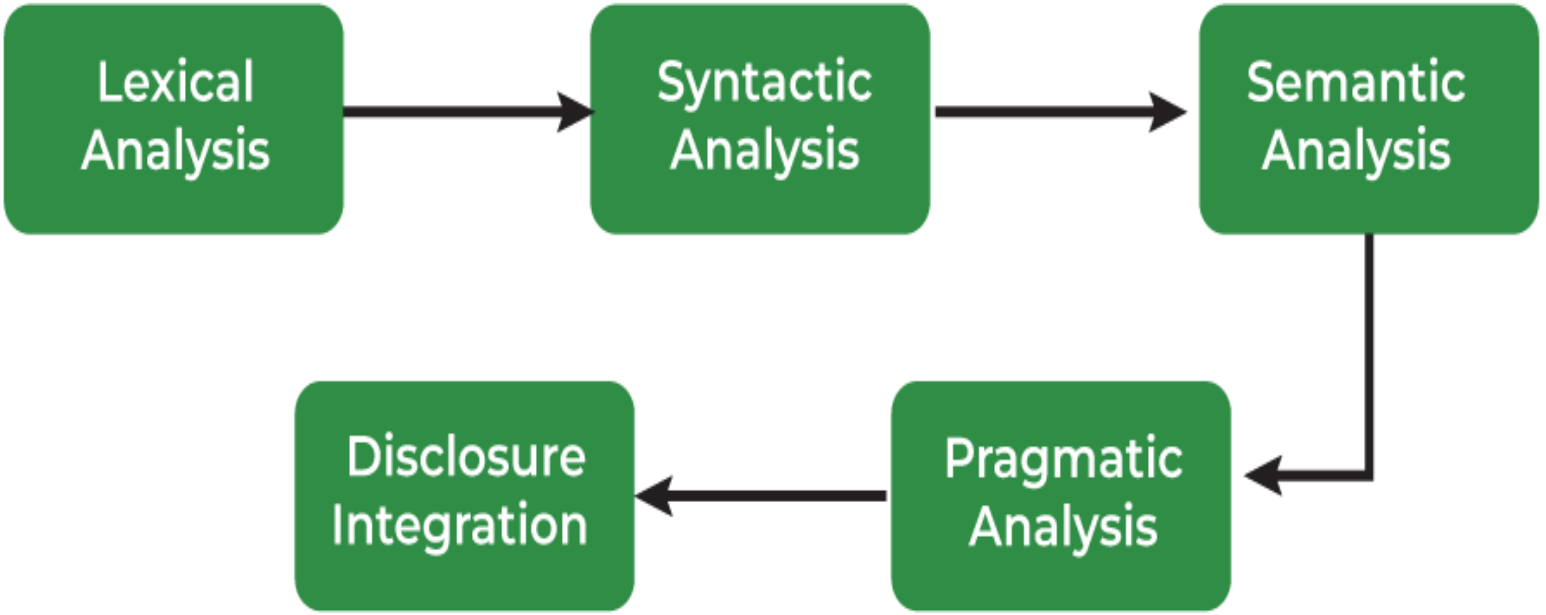
Overview of AI Technologies and techniques

- **4. <u>Reinforcement learning</u>** - In RL, the data is accumulated from machine learning systems that use a trial-and-error method to learn from outcomes and decide which action to take next.
- After each action, the algorithm receives feedback that helps it determine whether the choice it made was correct, neutral or incorrect.
- It performs actions with the aim of maximizing rewards, or in other words, it is learning by doing in order to achieve the best outcomes.

Overview of AI Technologies and techniques

- **2.Natural level Processing**
- The nature of human languages makes Natural Language Processing difficult because of the rules involved in passing information using natural language.
- NLP leverages algorithms to recognize and abstract the rules of natural languages, converting unstructured human language data into a computer-understandable format.

Overview of AI Technologies and techniques



Overview of AI Technologies and techniques

- **1. Lexical integration** - Lexical analysis is the process of converting a sequence of characters into a sequence of tokens.
- **2. Syntactic integration** - Syntactic analysis is the process of analyzing a string of symbols, either in natural language, computer languages, or data structures, conforming to the rules of formal grammar.
- **3. Semantic integration** - Semantic Analysis attempts to understand the meaning of the human language.
- It captures the meaning of the given text while considering context, logical structuring of sentences, and grammar roles.

Overview of AI Technologies and techniques

- **4. Pragmatic integration** - Pragmatic Analysis is part of the process of extracting information from text. It focuses on taking a structured set of text and figuring out the actual meaning of the text.
- **5. Disclosure integration** - Discourse analysis is used to uncover the motivation behind a text and is useful for studying the underlying meaning of a spoken or written text as it considers the social and historical contexts of it.

Overview of AI Technologies and techniques

- **Computer Vision:**
- Computer Vision equips machines with the ability to interpret visual information from the world.
- This technique has revolutionized industries like healthcare, automotive, and robotics, enabling tasks such as facial recognition, object detection, and autonomous driving.
- The extent to which it can discriminate between objects is an essential component of machine vision.

Overview of AI Technologies and techniques