Artificial Intelligence

For Prelims: **Artificial Intelligence (AI)**, Weak AI, Strong AI, Differences Between AI, ML and DL, Types of AI.

For Mains: Indigenization of Technology & Developing New Technology, Awareness in Different Fields, Advantages of AI, Disadvantages of AI, Applications of AI in Different Sectors.

The year 2022 brought Artificial Intelligence (AI) into the mainstream through widespread familiarity with applications of Generative Pre-Training Transformer (GPT). The most popular application is OpenAI's ChatGPT. The widespread interest and fascination surrounding ChatGPT have contributed to its recognition as a prominent example of AI technology among consumers. However, it represents only a small portion of the ways that AI technology is being used today.

What is AI?

- **About:**
  - AI is the ability of a computer, or a robot **controlled by a computer to do tasks that are usually done by humans** because they require human intelligence and discernment.
    - Although there is **no AI that can perform the wide variety of tasks an ordinary human can do**, some AI can match humans in specific tasks.
- **Characteristics & Components:**
  - The ideal characteristic of artificial intelligence is its **ability to rationalize and take actions** that have the best chance of achieving a specific goal. A subset of AI is **Machine Learning (ML).**
    - Deep Learning (DL) techniques **enable this automatic learning** through the absorption of huge amounts of unstructured data such as text, images, or video.

How is Global AI Currently Governed?

- **India:**
  - **NITI Aayog**, has issued some guiding documents on AI Issues such as the National Strategy for AI and the **Responsible AI for All report.**
  - Emphasises **social and economic inclusion**, innovation, and trustworthiness.
- **United Kingdom:**
  - Outlined a light-touch approach, asking regulators in different sectors to apply existing regulations to AI.
  - **Published a white paper outlining five principles companies should follow:** safety, security and robustness; transparency and explainability; fairness; accountability and governance; and contestability and redress.
- **US**:
  - The US **released a Blueprint for an AI Bill of Rights (AIBoR), outlining the harms of AI to economic and civil rights** and lays down five principles for mitigating these harms.
  - The Blueprint, instead of a horizontal approach like the EU, endorses a sectorally specific approach to AI governance, with policy interventions for individual sectors such as health,

labour, and education, leaving it to sectoral federal agencies to come out with their plans.

- **China:**
  - In 2022, China came out with some of the **world's first nationally binding regulations** targeting specific types of algorithms and AI.
  - It enacted a law to regulate **recommendation algorithms with a focus on how they disseminate information.**

What are the Differences Between AI, ML and DL?

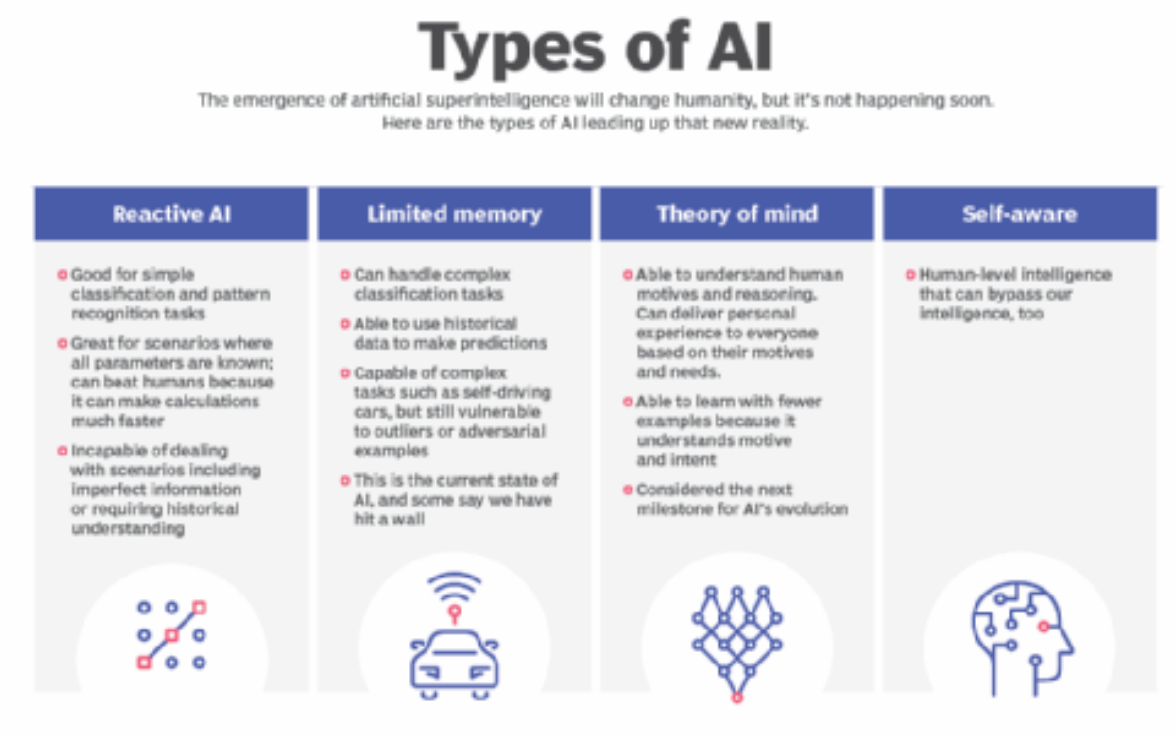
- The term AI, **coined in the 1950s,** refers to the simulation of human intelligence by machines. AI, ML and DL are **common terms and are sometimes used interchangeably. But there are distinctions.**
  - ML is a **subset of AI that involves the development of algorithms** that allow computers to learn from data without being explicitly programmed.
    - ML algorithms can analyze data, identify patterns, and make predictions based on the patterns they find.
  - DL **is a subset of ML** that uses artificial neural networks to learn from data in a way **that is similar to how the human brain learns.**

What are the Different Categories of AI?

- Artificial intelligence can be **divided into two different categories:**
  - **Weak AI/ Narrow AI:** It is a type of AI that is limited to a specific or narrow area. Weak AI simulates human cognition.
    - It has **the potential to benefit society by automating time-consuming tasks** and by analyzing data in ways that humans sometimes can't.
    - For example, **video games such as chess and personal assistants** such as Amazon's Alexa and Apple's Siri.
  - **Strong AI:** These are systems that carry on tasks considered to be human-like. These **tend to be more complex and complicated systems.**
    - They are **programmed to handle situations in which they may be required to problem-solving** without having a person intervene.
    - These kinds of systems **can be found in applications like self-driving cars.**

What are the Different Types of AI?

- **Reactive AI:** It uses algorithms to optimize outputs based on a set of inputs. Chess-playing AI, for example, are reactive systems that optimize the best strategy to win the game.
  - Reactive AI **tends to be fairly static,** unable to learn or adapt to novel situations. Thus, it will **produce the same output given identical inputs.**
- **Limited Memory AI:** It can adapt to past experiences or update itself based on new observations or data. Often, the amount of updating is limited, and the length of memory is relatively short.
  - **Autonomous vehicles**, for example, can read the road and adapt to novel situations, even learning from past experience.
- **Theory-of-mind AI:** They are fully adaptive and have an extensive ability to learn and retain past experiences. These types of AI include advanced chat-bots that could **pass the Turing Test**, fooling a person into believing the AI was a human being.
  - A Turing test is a method of inquiry in AI for determining **whether or not a computer is capable of thinking like a human being.**
- **Self-aware AI:** As the name suggests, become sentient and aware of their own existence. Still, in the realm of science fiction, some experts believe that an **AI will never become conscious or alive.**



What is the Difference Between Augmented Intelligence and AI?

- **The Difference in Focus:** Artificial Intelligence is focused on creating machines that can perform tasks autonomously, without human intervention. On the other hand, Augmented Intelligence is the use of technology to enhance human intelligence, rather than replace it.
    - **Augmented Intelligence systems are designed to work alongside humans** to improve their ability to perform tasks.
- **The Difference in Goal:** The goal of AI is to create machines that can perform tasks that require human intelligence, such as decision-making and problem-solving.
    - The goal of Augmented Intelligence, on the other hand, is **to enhance human capabilities, by providing them with tools and technologies** that can help them make better decisions and solve problems more efficiently.

What are the Applications of AI in Different Sectors?

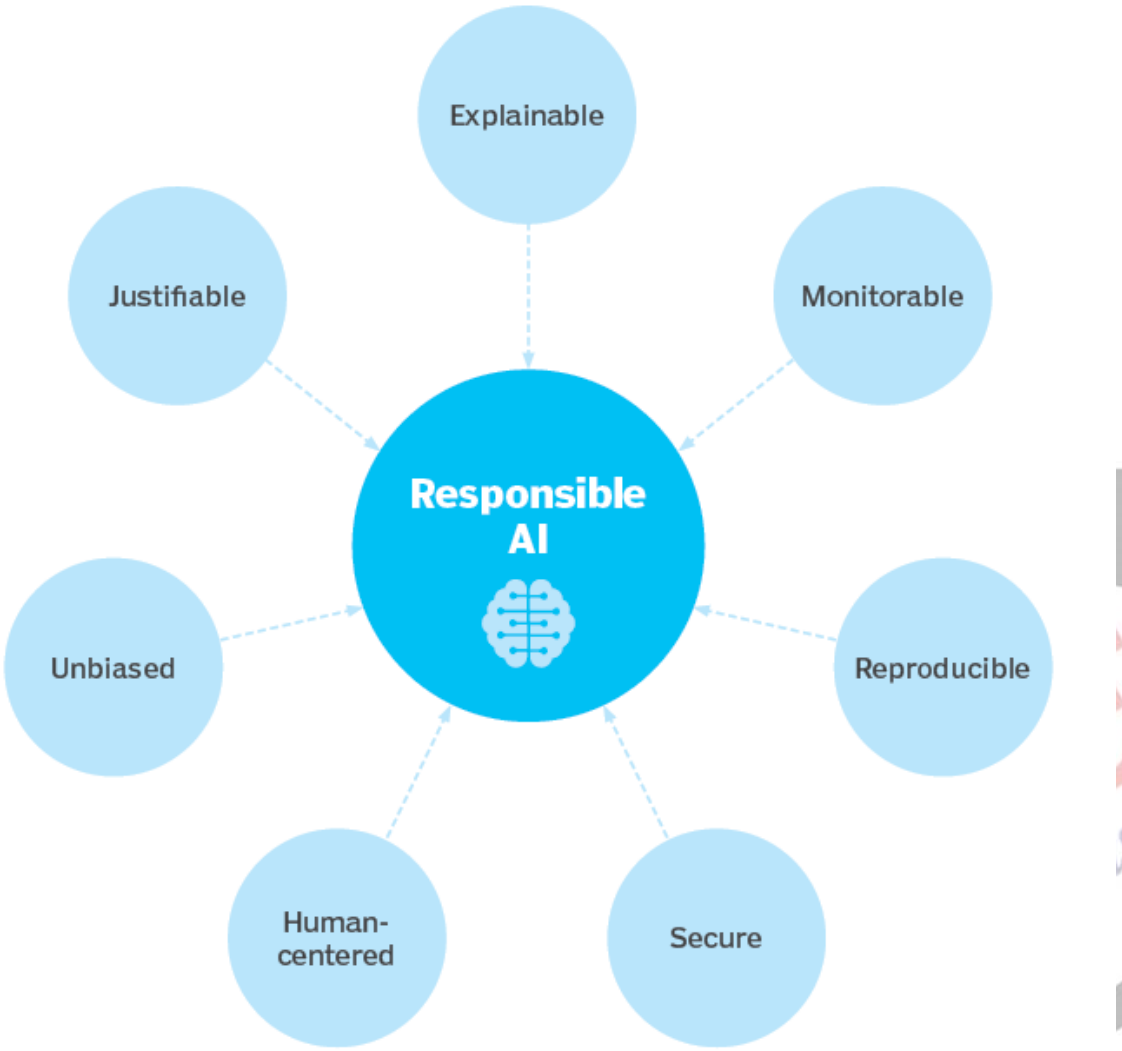
- **Healthcare:** It aims to enhance diagnosis accuracy, enable personalized treatment, improve patient outcomes, streamline healthcare operations, and accelerate medical research and innovation.
    - Recently, the **Indian Council of Medical Research (ICMR)** issued a guiding document- "The Ethical Guidelines for Application of AI in Biomedical Research and Health care", which outlines 10 key patient-centric ethical principles **for AI application in the health sector.**
- **Business:** AI in the business sector helps optimize operations, enhance decision-making, automate repetitive tasks, improve customer service, enable personalized marketing, analyze **big data** for insights, detect fraud and **cybersecurity** threats, streamline supply chain management, and drive innovation and competitiveness.
- **Education:** AI could open new possibilities for innovative and personalised approaches catering to different learning abilities.
    - **IIT Kharagpur has collaborated with Amazon Web Services to develop the National AI Resource Platform (NAIRP)**, the future possibilities of which include monitoring eye movement, motion and other parameters for better teaching and learning.
    - As demonstrated by **ChatGPT, Bard** and other large language models, generative AI can help educators and engage students in new ways.
- **Judiciary**: It is used to improve legal research and analysis, automate documentation and case management, enhance court processes and scheduling, facilitate online dispute resolution, assist

in legal decision-making through predictive analytics, and increase access to justice by providing virtual legal assistance and resources.
    - **SUVAS (Supreme Court Vidhik Anuvaad Software):** It is an AI system that can assist in the translation of judgments into regional languages.
        - This is another landmark effort to increase access to justice.
    - **SUPACE (Supreme Court Portal for Assistance in Court Efficiency):** It was recently launched by the Supreme Court of India.
- **Cybersecurity/Security:** It is used in security and cybersecurity to detect and prevent cyber threats, identify anomalous activities, analyze large volumes of data for patterns and vulnerabilities, enhance network and endpoint security, automate threat response and incident management, strengthen authentication and access control, and provide real-time threat intelligence and predictive analytics for proactive defense against cyber attacks.

What are the Advantages of AI?

- **Enhanced Accuracy:** AI algorithms can analyze vast amounts of data with precision, reducing errors and improving accuracy in various applications, such as diagnostics, predictions, and decision-making.
- **Improved Decision-Making:** AI provides data-driven insights and analysis, assisting in informed decision-making by identifying patterns, trends, and potential risks that may not be easily identifiable to humans.
- **Innovation and Discovery:** AI fosters innovation by enabling new discoveries, uncovering hidden insights, and pushing the boundaries of what is possible in various fields, including healthcare, science, and technology.
- **Increased Productivity:** AI tools and systems can augment human capabilities, leading to increased productivity and output across various industries and sectors.
- **Continuous Learning and Adaptability:** AI systems can learn from new data and experiences, continually improving performance, adapting to changes, and staying up-to-date with evolving trends and patterns.
- **Exploration and Space Research:** AI plays a crucial role in space exploration, enabling autonomous spacecraft, robotic exploration, and data analysis in remote and hazardous environments.

What are the Ethical Considerations of AI?



What are the Disadvantages of AI?

- **Job Displacement:** AI automation may lead to the displacement of certain jobs as machines and algorithms can perform tasks that were previously done by humans. This can result in unemployment and require re-skilling or retraining of the workforce.
- **Ethical Concerns:** AI raises ethical concerns such as the potential for bias in algorithms, invasion of privacy, and the ethical implications of autonomous decision-making systems.
- **Reliance on Data Availability and Quality:** AI systems heavily rely on data availability and quality. Biased or incomplete data can lead to inaccurate results or reinforce existing biases in decision-making.
- **Security Risks:** AI systems can be vulnerable to cyber attacks and exploitation. Malicious actors can manipulate AI algorithms or use AI-powered tools for nefarious purposes, posing security risks.
- **Overreliance:** Blindly relying on AI without proper human oversight or critical evaluation can lead to errors or incorrect decisions, particularly if the AI system encounters unfamiliar or unexpected situations.
- **Lack of Transparency:** Some AI models, such as deep learning neural networks, can be difficult to interpret, making it challenging to understand the reasoning behind their decisions or predictions (referred to as the "black box" problem).
- **Initial Investment and Maintenance Costs:** Implementing AI systems often requires significant upfront investment in infrastructure, data collection, and model development. Additionally,

maintaining and updating AI systems can be costly.

What can be the Way Forward?

- **Ethical and Responsible AI:** It is crucial to prioritize the development and deployment of AI systems that are ethical, transparent, and accountable. This includes addressing biases, ensuring privacy and data protection, and establishing clear regulations and guidelines.
- **Continued Research and Innovation:** AI is a rapidly evolving field, and ongoing research and innovation are necessary to advance its capabilities further. Investments in fundamental research, such as developing new algorithms and models, can lead to breakthroughs and improved performance.
- **Data Quality and Accessibility:** High-quality and diverse datasets are essential for training AI models effectively. Efforts should focus on improving data collection, cleaning, and labeling processes.
    - Additionally, promoting data sharing and accessibility can foster collaboration and accelerate progress across different domains.
- **Human-AI Collaboration:** AI should be designed to augment human capabilities rather than replace them entirely. Emphasizing human-AI collaboration can lead to more effective solutions and enhance productivity in various industries.
    - User-centered design and interfaces that facilitate seamless interaction with AI systems are important considerations.
- **Domain-Specific Applications:** Identifying and prioritizing specific domains where AI can have a significant impact is key. Tailoring AI solutions to address specific challenges in fields such as healthcare, transportation, finance, and education can yield tangible benefits and drive adoption.
- **Continued Education and Workforce Development:** Preparing the workforce for an AI-driven future is crucial. Initiatives focused on AI education and upskilling programs can help individuals acquire the necessary skills to thrive in a changing job market.
    - Encouraging interdisciplinary collaboration and fostering partnerships between academia, industry, and government can further support these efforts.
- **International Collaboration and Standards:** Collaboration across countries and organizations is essential for sharing knowledge, best practices, and addressing global challenges associated with AI. Establishing international standards and frameworks can ensure interoperability, fairness, and security in the development and deployment of AI systems.

Conclusion

AI has all the ability to surpass human intelligence and can perform any particular task much accurately and efficiently. There is also no doubt that AI possesses immense potential which further helps to create a better place to live in. However, anything in excess is not good and nothing can be matched at par with the human brain.

Therefore, AI should not be used excessively as too much automation and dependent on machines can create a very hazardous environment for the present human mankind and for the next generations to come.

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Q. With the present state of development, Artificial Intelligence can effectively do which of the following? (2020)

1. Bring down electricity consumption in industrial units
2. Create meaningful short stories and songs
3. Disease diagnosis
4. Text-to-Speech Conversion
5. Wireless transmission of electrical energy

Select the correct answer using the code given below:

(a) 1, 2, 3 and 5 only
(b) 1, 3 and 4 only
(c) 2, 4 and 5 only
(d) 1, 2, 3, 4 and 5

Ans: (b)