Generative Artificial Intelligence

Prelims: Generative Artificial Intelligence, AI, Generative Adversarial Network, Variational Autoencoders (VAEs), National Strategy for Artificial Intelligence.

Mains: Applications of Generative AI, Issues Associated with Generative AI, AI and Ethics.

Why in News?

The use of **Generative Artificial Intelligence (GAI)** is still in its early stages but its impact is likely to grow as technology continues to evolve and improve.

- The Government of India is cognizant of the emergence of the technologies related to GAI and their rapid proliferation in sectors like education, manufacturing, healthcare, finance, and others.

What is Generative Artificial Intelligence?

- **About:**
  - GAI is a rapidly growing branch of AI that focuses on generating new content (such as images, audio, text, etc.) based on patterns and rules learned from data.
  - The rise of GAI can be attributed **to the development of advanced generative models**, such as **Generative Adversarial Networks (GANs) and Variational Autoencoders (VAEs).**
    - These models are trained on large amounts of data and are able to generate new outputs that are similar to the training data. For example, a GAN trained on images of faces can generate new, synthetic images of faces that look realistic.
  - While GAI is often associated with **ChatGPT** and **deep fakes,** the technology was initially used to automate the repetitive processes used in digital image correction and digital audio correction.
  - Arguably, because **machine learning** and deep learning are inherently focused on generative processes, they can be considered types of GAI, too.
- **Applications:**
  - **Art and Creativity:**
    - It can be used to generate new works of art that are unique and innovative, **helping artists and creatives explore new ideas** and push the boundaries of traditional art forms.
      - **DeepDream Generator** - An open-source platform that uses deep learning algorithms to create surrealistic, dream-like images.
      - **DALL·E2** - This AI model from OpenAI generates new images from text descriptions.
  - **Music:**
    - It can help musicians and music producers explore new sounds and styles, leading to more diverse and interesting music.
      - **Amper Music** - creates musical tracks from pre-recorded samples.
      - **AIVA -** uses AI algorithms to compose original music in various genres and

styles.
  - **Computer Graphics:**
    - It can generate new 3D models, animations, and special effects, helping movie studios and **game developers create more realistic and engaging experiences.**
  - **Healthcare:**
    - By generating new medical images and simulations, improving the **accuracy and efficiency of medical diagnoses** and treatments.
  - **Manufacturing and Robotics:**
    - It can help optimize manufacturing processes, improving the efficiency and quality of these processes.
- **Significance for India:**
  - As per NASSCOM data, the overall AI employment in India is estimated at about 416,000 professionals.
  - The growth rate for the sector is estimated at about 20-25%. Further, AI is expected to contribute an additional USD 957 billion to India's economy, by 2035.

What are the Concerns Related to GAI?

- **Accuracy:**
  - One of the biggest challenges is ensuring that the **outputs generated by GAI are of high quality and accurate.**
  - This requires the **development of advanced generative models** that can accurately capture the patterns and rules learned from data.
- **Partisan GAI Models:**
  - GAI models are trained on large amounts of data, and if that data is biased, the outputs generated by GAI may also be biased. This can lead to **discrimination and reinforce existing societal biases.**
- **Privacy:**
  - Training GAI models requires access to large amounts of data, which could include personal and sensitive information.
  - There is a risk that this **data could be used for unethical purposes, such as for targeted advertising or for political manipulation.**
- **Responsibility:**
  - Since GAI models can generate new content, such as images, audio, or text it **may be used to generate fake news or other malicious content**, without knowing who is responsible for the output. This could lead to **ethical dilemmas over responsibility.**
- **Automation and Lowering Job:**
  - GAI has the potential to automate many processes, which could lead to job displacement for people who are skilled in those areas.
  - This raises questions **about the ethics of using AI for job displacement and the potential impact** on workers and society.

What are the Related Indian Initiatives?

- **National Strategy for Artificial Intelligence:**
  - The Government has published the National Strategy for Artificial Intelligence with the objective of **developing an ecosystem for the research and adoption of Artificial Intelligence.**
- **National Mission on Interdisciplinary Cyber-Physical Systems:**
  - Under this Mission, Technology Innovation Hubs (TIH) has been established on Artificial Intelligence and Machine Learning at the Indian Institute of Technology (IIT) Kharagpur, which aims to provide the state-of-the-art training and capacity building **for the creation of next-generation scientists, engineers, technicians, and technocrats in the field of Artificial Intelligence.**
- **Artificial Intelligence Research, Analytics and Knowledge Assimilation Platform:**
  - It is a Cloud computing platform, aiming **to make India a pioneer amongst emerging economies with regards to AI** and transform sectors like education, health, agriculture, urbanization and mobility.

Way Forward

- More research and development is needed to improve the accuracy and reliability of **GAI models and to address ethical concerns related to the technology.** This includes developing new algorithms and models that are more transparent and accountable for their outputs.
- Regulations and standards **must be put in place to ensure that GAI is used in a responsible and ethical manner.** This includes establishing guidelines for data privacy, bias, and accountability, as well as ensuring that GAI is used for the benefit of society and not to the detriment of individuals or groups.
- **Collaboration between stakeholders**, including industry, government, academia, and civil society, is crucial to ensure that GAI is used in a responsible and ethical manner.
- GAI models are only as good as the data they are trained on, so it is important to ensure that the data used for training GAI models is ethical and unbiased. This includes ensuring that the data used for training is collected and **used in a way that respects the privacy of individuals and does not reinforce existing biases.**

UPSC Civil Services Examination, Previous Year Question (PYQ)

Q1. 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)

Q2. Consider the following pairs: (2018)

	Terms sometimes seen in news	Context/Topic
1.	Belle II experiment	Artificial Intelligence
2.	Blockchain technology	Digital/Cryptocurrency
3.	CRISPR–Cas9	Particle Physics

Which of the pairs given above is/are correctly matched?

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

Ans: (b)

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