GPT-4 — A SHIFT FROM 'WHAT IT CAN DO' TO 'WHAT IT AUGURS

Context

- Recently, Microsoft-backed OpenAI launched its artificial intelligence (AI) model GPT-4, an upgrade from GPT-3.5.
- The article highlights the new features embedded in GPT-4 model, the challenges associated with it and what is augurs for the future.

What is the Meaning of Generative Pre-Trained Transformer (GPT)?

- GPTs are **machine learning algorithms** that respond to input with human-like text. They have the following characteristics:
  - **Generative**: They generate new information.
  - **Pre-trained**: They first go through an unsupervised pre-training period using a large corpus of data. Then they go through a supervised fine-tuning (to specific tasks) period to guide the model.
  - **Transformers**: They use a deep learning model (transformers) that learns context by tracking relationships in sequential data. Specifically, GPTs track words or tokens in a sentence and predict the next word or token.

About GPT-4

- It is OpenAI's large multimodal language model that generates text from textual and visual input.
- It can understand and produce language that is creative and meaningful, and will power an advanced version of the company's sensational chatbot, ChatGPT.

Significance of GPT-4

- It is more conversational and creative and is a remarkable **improvement over its predecessor**, GPT-3.5, which first powered ChatGPT.
  - While GPT-3.5 could not deal with large prompts well, GPT-4 can take into context up to 25,000 words, an improvement of **more than 8x**.
- Its biggest innovation is that it can **accept text and image input simultaneously**, and consider both while drafting a reply.
  - For example, if given an image of ingredients and asked the question, "What can we make from these?" GPT-4 gives a list of dish suggestions and recipes.

Limitations of GPT-4

- It has **failed to do well in advanced English** language and **literature**, scoring 40% in both.
- As ChatGPT-generated text infiltrated school essays and college assignments almost instantly after its release; its prowess now **threatens examination systems** as well.
- It leaves **manufacturing or scientific jobs** relatively **untouched**.
- GPT-4 is still prone to a lot of flaws similar to its predecessor as its output may not always be factually correct.
  - This trait is referred to by OpenAI as "**hallucination**".
- OpenAI has also **not been transparent** about the inner workings of GPT-4 owing to reasons associated with both the competitive landscape and the safety implications of large-scale models like GPT-4.

Conclusion

- There are global attempts being made to create a model with a trillion degrees of freedom.
- However, these will be truly enormous language-models that arouse concerns about what they cannot do.

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40 MORE WOMEN OFFICERS SET TO GET COLONEL RANK

Why in news?

- Around 40 more women Army officers are set to be cleared for the rank of colonel (selection grade) in phases over the next two to three years.
  - **A total of 108 women officers,** out of 244, were cleared for the rank of colonels by a special selection board in January 2023.
  - They have already assumed command roles in various Army units across the country.
- This move will make them eligible to command units in their respective arms and services in the future.
  - The SC order to grant permanent commission to women Army officers in Feb 2020 opened the doors for their promotion across all streams of the Army, except pure combat arms.

Participation of Women in Defence Sector

Army (as on 1st July, 2022)	Officers (Excluding AMC/ADC)	3.97%
	Officers (AMC/ADC)	21.25
	MNS Officers	100%
	JCO/OR	0.01%
Navy	Officers	About
Air Force (as on 1st Dec, 2022)	Officers (excluding Medical & Dental Branch)	13.69%

- **Navy**
  - The induction of women as officers in the Indian Navy commenced in the year 1991.
  - Since then, the Indian Navy has gradually opened all branches to women officers including induction through NDA.
- In Navy, women are engaged in activities such as firing torpedoes and missiles at enemy warships.
- Women officers also serve on board naval warships in combat, albeit discharging non-combat roles.
  - In 2020, the Indian Navy started deploying its first batch of women pilots on the Dornier maritime aircraft.
  - Further, for the first time, women are also being recruited for sailors' entries under the Agnipath Scheme w.e.f. 2022.
- 20% vacancies are reserved for women.
- **Air Force**
  - Officers recruitment in the IAF is gender neutral. Women officers are inducted in all the branches and streams of IAF.
  - In 2015, Indian Air Force had opened new combat roles for women as fighter pilots.
  - This experimental scheme to induct women officers in all combat roles has now been regularised into a permanent scheme.
- **Army**
  - Initially, woman officers were permitted PC in only two services – the Judge Advocate General's Branch and the Army Education Corps.
  - In February 2020, the defence ministry permitted SSC women officers in another eight arms/services to be granted PC.

- This happened after the Supreme Court, in February 2020, granted **women the right to permanent commission (PC), and the right to command**.
  - Hence, at present, the women are being commissioned in Indian Army in ten Streams.
  - Now the prestigious National Defence Academy (NDA) has started accepting women cadets.
- In 2021, the Supreme Court allowed women to appear for the upcoming entrance exam of the National Defence Academy (NDA).
  - So far, **no combat role has been given to women in Army**.
- The 'no women in combat' rule was not challenged in the SC and the apex court did not rule on this.

- **Recent developments in Army**
  - For the first time, five women officers have cleared the prestigious Defence Services Staff Course (DSSC) and Defence Services Technical Staff Course (DSTSC) Exam.
  - Recently, a women officer has been deployed, for the first time, to a post in the Siachen Glacier.
  - The Army has so far recruited six meritorious sportswomen into the Corps of Military Police under its **Mission Olympic Programme**.
- The Indian Army was the first among the three Services to open its soldier ranks to women in the Corps of Military Police.
  - In January 2023, Indian Army deployed its largest-ever contingent of women soldiers for UN peacekeeping operations in the volatile oil-rich Abyei region of Africa.
- This is **India's largest single unit of women peacekeepers** in a UN Mission.

WHAT IS GSAT 7B?

The Ministry of Defence recently signed a contract with ISRO's commercial arm New Space India Ltd (NSIL) for the procurement of an advanced communication satellite, GSAT-7B.

About GSAT 7B:

- It is a **communication satellite** part of the **GSAT-7 series.**

- GSAT 7 series satellites are **advanced communication satellites developed by** the **Indian Space Research Organisation (ISRO**) to meet the **communication needs of the defence services.**
- The GSAT 7B will **primarily fulfil the communication needs of the Indian Army**.
- It is a geostationary satellite which will considerably **enhance the communication capability of the Indian Army** by providing mission-critical beyond-the-line-of-sight communication to troops and formations as well as weapon and airborne platforms.
- It is the **first-ever in the five-tonne category** that will be designed indigenously **by the ISRO.**

WHAT IS THE SKY CANVAS PROJECT?

A Tokyo-based space company, ALE, recently announced that it will create the world's first artificial meteor shower in 2025 under the project Sky Canvas.

About Sky Canvas Project:

- It is the **world's first artificial meteor shower project.**
- **The aim** of the project will be to **collect atmospheric data in the mesosphere.**
- Under this project, **meteor-replicating particles will be installed in a satellite 250 miles (400 km) up** and then **released over a designated area**.
- These **metallic particles** will be spheres with a **diameter of 0.4 inches** (1 cm) and a **mass of a few grams.**
- **The pea-sized balls** have a secret chemical formula that causes them to **light up from the friction of re-entry** at speeds of up to five miles (8km) a second.
- ALE says they will **travel more slowly and light up for longer than natural shooting stars** - up to ten seconds each.
- They **will be visible over a 125-mile (200 km) area.**
- The ingredients in the pellets can be altered to change the colour, which means that a multi-coloured flotilla of shooting stars could be created.

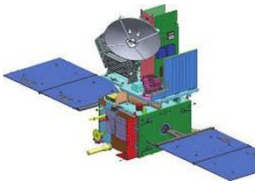
What is Mesosphere?

- The mesosphere is a **layer of Earth's atmosphere**.

- It is **directly above the stratosphere and below the thermosphere**.
- It extends from about **50 to 85 km (31 to 53 miles) above our planet**.
- **The transition between the mesosphere and the thermosphere** is called
- **Temperature decreases with height throughout the mesosphere**.
- The **coldest temperatures in Earth's atmosphere**, about -90° C (-130° F), **are found near the top of this layer.**

EOS-06 SATELLITE

Recently, the Indian Space Research Organisation (ISRO) released images of Earth captured by the EOS-06 satellite.



About the EOS-06 satellite:

- Earth Observation satellite (EOS-6) is the third-generation satellite in the Oceansat series.
- This is to provide continuity services for Oceansat-2 spacecraft with enhanced payload specifications as well as application areas.
- Payloads of the satellite are
  - Ocean Color Monitor (OCM-3)
  - Sea Surface Temperature Monitor (SSTM)
  - Ku-Band Scatterometer (SCAT-3)
  - ARGOS

What are the objectives of the Mission?

- To ensure the data continuity of Ocean colour and wind vector data to sustain the operational applications.
- To improve the applications, some additional datasets such as **Sea Surface Temperature** and more number of bands in the Optical region for fluorescence and in the Infrared region for atmospheric corrections are accommodated.
- To develop/improve related algorithms and data products to serve in well-established application areas and to enhance the mission utility.

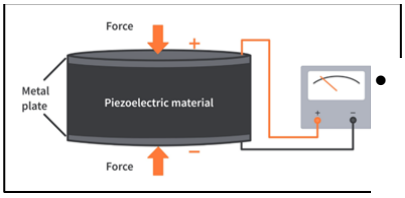
- The EOS-06 is envisaged to observe **ocean color data**, sea surface temperature and wind vector data to use in Oceanography, **climatic and meteorological applications**.
- The satellite also supports value added products such as potential **fishing zone** using chlorophyll, SST and wind speed and land based geophysical parameters.

SCIENTISTS SPOT PIEZOELECTRIC EFFECT IN LIQUIDS FOR THE FIRST TIME

Why in News?

- A pair of chemists at Michigan State University has observed the piezoelectric effect in liquids for the first time.
- In their paper published in **The Journal of Physical Chemistry Letters**, **Iqbal Hossain** and **G. J. Blanchard**, describe accidently observing the property while studying ionic liquids.

What is the Piezoelectric Effect?



- The piezoelectric effect is a phenomenon where specific types of material (e.g., **quartz**, **topaz**, etc.) produce an electric charge proportional to the mechanical stress applied to them.
- It occurs when there is a conversion of kinetic or mechanical energy due to crystal deformation, into electrical energy.
- **Piezoelectric materials are materials that can produce electricity due to mechanical stress**.
- When a piezoelectric material is placed under mechanical stress, there is a shift of the positive and negative charge centres in the material, which then results in an external electric field.

Applications of Piezoelectric Effect:

- Developed in the 1900s to detect icebergs, the **sonar device is the first practical application for piezoelectric devices**.
- Sensors, high voltage generators, electronic frequency generators, microbalances, inkjet printers, and ultra-fine focusing and alignment of optical assemblies among others all exploit piezoelectric technology.

- It is also the basis of a number of scientific instrumental techniques with atomic resolution, such as **scanning tunnelling microscopes**.

Discovery of Piezoelectric Effect in Liquids:

- The researchers at Michigan State University were studying properties of ionic liquids.
  - Ionic liquids are made from salts with unsymmetrical, flexible organic cations and symmetrical weakly coordinating anions.
- The liquid piezoelectric material was discovered as the researchers applied pressure with a piston to a sample of an ionic liquid in a cylinder.
- To their surprise, they found that this led to the release of electricity.
- They also found that the amount of electricity released was proportional to the amount of pressure applied.

What is the Significance of this Discovery?

- The reason the piezoelectric effect has only been expected in solids thus far is that the body being squeezed needs to have an organised structure, like the pyramids of quartz.
- Liquids do not have such structure; instead, they take the shape of their container.
- The researchers suggest that liquid piezoelectric materials could prove to be useful, especially ones made using ionic liquids, because **they would be more environmentally friendly than solid materials**.
- They also note that **liquid piezoelectric materials could allow more variety in device shape, opening up wider design opportunities**.

TIBETAN BUDDHISM

Recently, Dalai Lama named a US-born Mongolian boy as the 10th Khalkha Jetsun Dhampa, the head of the Janang tradition of Tibetan Buddhism.

About Tibetan Buddhism:

- Buddhism originated in India and became the predominant religion in Tibet by the 9th century AD.

- It evolved from the Mahayana and Vajrayana traditions of Buddhism, incorporating many tantric and shamanic practices of both post-Gupta period Buddhism in India.
- Tibetan Buddhism also incorporates the Bon religion which was spread across Tibet before Buddhism's arrival.
- Tibetan Buddhism has 4 major schools: **Nyingma** (8th century), **Kagyu** (11th century), **Sakya** (1073) and **Gelug** (1409)
- The Janang school (12th century) is one of the smaller schools that grew as an offshoot of the **Sakya school.**

What is Gelug School?

- Since 1640, the Gelug School has been the predominant school of Tibetan Buddhism.
- The Dalai Lama belongs to Gelug School ('**Dalai' means 'ocean' in Mongol**).
- The Dalai Lama is the **foremost spiritual and temporal authority of Tibet**.
- The 5th grand lama of the school, **Ngawang Lobsang Gyatso**, was first conferred the title of Dalai Lama.
- To consolidate his rule, he instituted the tradition of succession through reincarnation in the Gelug School.
- He claimed to be the reincarnation of **Avalokiteshvara**, one of the most important Bodhisattvas in Mahayana traditions.

PHOTOVOLTAIC WASTE: INDIA'S SOLAR PUSH AUGURS A LOOMING WASTE MANAGEMENT CHALLENGE

Why in News?

- Even though there has been a concerted push from policymakers in India to transition to a circular economy, **waste management in the solar photovoltaic sector still lacks clear directives**.

What is Photovoltaic Waste?

- Globally, India stands **fourth** in solar photovoltaic deployment, with a solar power installed capacity of **nearly 62 GW by 2022**.

- India's solar photovoltaic installations are dominated by **crystalline silicon (c-Si) technology.**
- **A typical photovoltaic panel** is made up of 93% of c-Si modules and 7% of cadmium telluride (CdTe) thin film modules.
- The metals used to manufacture c-Si modules are **silver, tin, and lead**. The CdTe thin film module is made of **glass, encapsulant, and compound semiconductor**.
- While this is certainly encouraging, it indicates **a serious issue of solar photovoltaic waste in future.**
- According to a report by the **International Renewable Energy Agency,** India could generate **50,000-3,25,000 tonnes** of cumulative photovoltaic waste by 2030 and more than 4 million tonnes by 2050.
- India is expected to become **one of the top five leading** photovoltaic waste producers globally by 2045-2050.
- According to a 2021 report, **approximately 50% of total materials can be recovered** through such waste management and recycling processes.

What are the Challenges India faces in Photovoltaic waste Management?

- **The growing informal handling**: Only about 20% of the waste is recovered in general, the rest is treated informally.
- **Waste accumulation at landfills**: This in turn causes **acidification, leaching of toxic metals** (such as lead and cadmium) into the soil, and contaminates the local water.
- **Leading to pollution:** Gradual incineration of the panel encapsulant also releases sulphur dioxide, hydrogen fluoride, and hydrogen cyanide into the atmosphere.
- **Ignorance of appropriate disposal practices:** Among multiple actors and institutions across the supply chain, including producers, owners, consumers, and waste disposal facilities.
- **Small market to repurpose or reuse recycled photovoltaic waste:** This is because of a lack of suitable incentives and schemes in which businesses can invest.
- **The absence of a regulatory body:** To measure, monitor, and report solar photovoltaic waste.