

IAF Centre of Excellence for Artificial Intelligence (GS Paper 3, Science and Tech)

Why in news?

- The Indian Air Force became the first among the services to establish a dedicated center of excellence for the artificial intelligence.
- The IAF Centre of Excellence for Artificial Intelligence under the **aegis of UDAAN** (Unit for Digitisation, Automation, Artificial Intelligence and Application Networking) was inaugurated recently,



Key Highlights:

- A Big Data Analytics and AI Platform has been commissioned in the IAF's AI Centre, for handling all aspects of **Analytics, Machine Learning, Natural Language Processing, Neural Networks and Deep Learning algorithms**.
- IAF has taken proactive steps to **embed Industry 4.0 and AI based technologies** in its war fighting processes.
- Artificial intelligence is rapidly changing supply logistics, intelligence gathering, sensors, and military robots through the application as commonly known as the **Internet of Battlefield Things (IoBT)**.
- The AI based applications are being developed with inhouse expertise in coordination with various PSUs, MSMEs and leading academia in the field of Artificial intelligence.

Artificial Intelligence (AI) in Air Combat:

- The **next generation combat jets** is largely based on the software-centric for its combat operations. The elements of engagement are based on the data for the target detection, tracking and combat operations.
- In the case of only operational fifth generation fighter jet—**F-22 and F-35**—the **target engagement activities are heavily software-generated**, covering upto 95% the entire combat activities.
- The cockpit is so filled with sensors and computer processors that Algorithms are already flying planes. The data received from the multi sensors-sub-systems forms the basis of such engagement.
- But that is also the biggest challenge for a pilot to read through and process the high-speed data in a complex air combat environment.

- Also the **Multi-platform Multi-Sensor Data Fusion (MPMSDF)** creates real time awareness.
- This is the core of AI based Decision Support Systems (DSS) which can fundamentally address such complex environment and analyze the sensory data through processors.

OODA:

- While the algorithm is already flying planes, AI is now more about how to fight its own, and how to get pilots to trust the AI.
- It zeroes in on the **OODA loop**—the decision cycle of **orient, observe, decide, and act**.

What are the fundamental basis for AI and OODA loop?

- In a well chronicled dogfights where American fighter aircraft **F-86 won against the Russian MiG-15**, the victories were based on the fact that **American pilots had a much shorter OODA loop** in the observing and acting phase of combat operation.
- The F-86 had the much **wider field of vision and easier hydraulic controls** that allowed them to outrun the OODA loops of Russian pilots.
- So, the role of AI is about processing such information which is difficult to achieve in shorter time-frame. AI can drastically reduce the OODA loop. This is one of such applications.
- Further, AI is also being deliberated across the **C4I (Command, Control, Communication, Computers and Intelligence)** management system.
- The research in this area is taking place at a staggering speed to achieve a MIL Grade standard and using AI in a SaaS (Software as a Service) model.

AI for Autonomous Vehicle:

- AI is the reason behind the explosive growth in innovative applications of **Unmanned Aerial Vehicles (UAVs)** and its **military applications**.
- AI applications in UAVs are spreading across an impressive variety of domains, including ISR (**intelligence, surveillance and reconnaissance**) and **Targeting**.
- Worldwide, military is heavily spending on the computer vision capability of artificial intelligence for activities like detect and hunt down submarines, detect an enemy intrusion, or decode messages using machine learning abilities.

Leonidas:

- AI application is also playing crucial role in developing **anti-combat drone solutions**.
- In a recent development, a US Start-up Epirus has developed **Leonidas**, a technology that **can disable a hostile drone while leaving a friendly drone** a few feet distant unharmed.
- Using super-dense Gallium Nitride power amplifiers and based on the AI algorithms, Leonidas uses direct energy to precise frequencies which can take out both large fixed-wing drones and small quadcopters.

Aircraft maintenance:

- Besides, IAF has been pioneering AI in area of aircraft maintenance. IAF has substantially digitised its fleets onto the electronic maintenance management systems.
- IAF has also digitized the entire inventory management system which works on AI-based formulation to come out with predictive maintenance or predictive threat scenarios or red flags.

Challenges for AI:

- While AI is being developed some of the challenges are critical especially in its military applications.
- Here is the need to address some questions to this effect- whether algorithms can be trained to effectively execute mission planning behaviors in unpredictable scenarios; **can machines be taught combat strategies**; could sufficiently generalized representations be built to capture the richness of the planning problem itself across the threat matrix.

Way Forward:

- AI is not just a tactical advantage but it is become a necessity. Nations such as China, US and Russia, and many others are already investing heavily in AI.

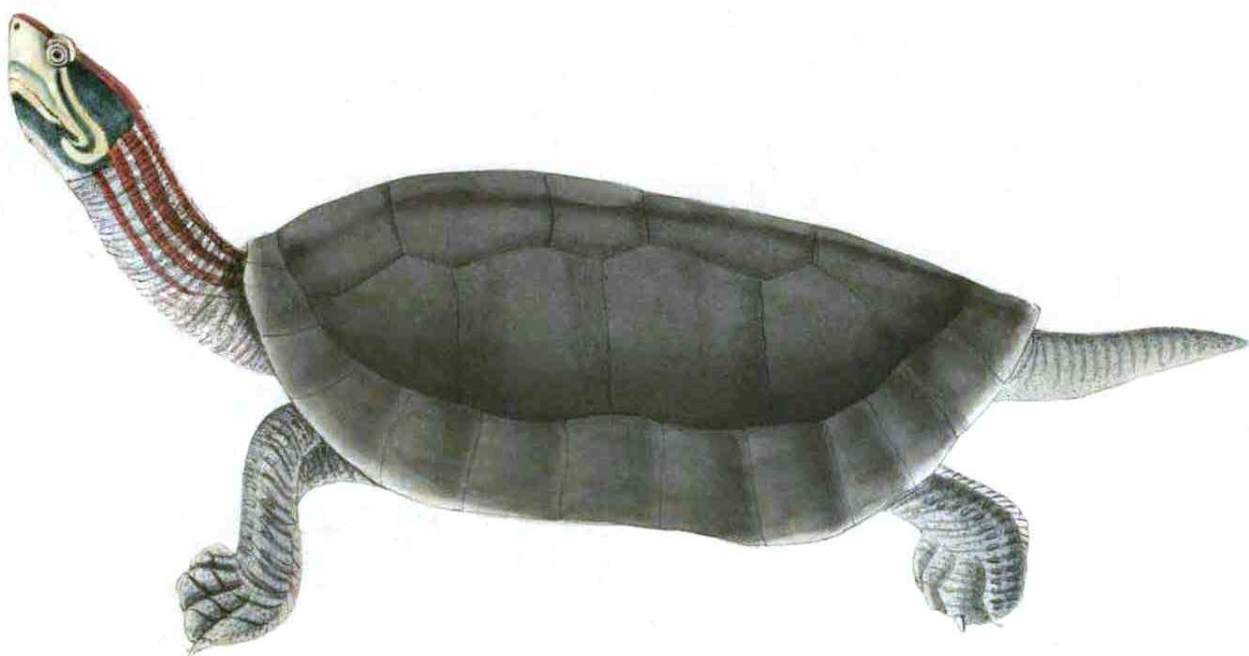
- The need for the big data to train and test combat systems will be required for IAF.
- The data collection, assimilation, and analysis together will drive the AI for the next generation. Integrating AI in military strategies will be the cornerstone of the defence sector. AI is the only way to navigate through this new paradigm of warfare.

India for addition of Red-crowned Roofed Turtle to CITES Appendix I

(GS Paper 3, Environment)

Why in news?

- Recently, India has submitted a proposal to the **United Nation Convention on International Trade in Endangered Species** on Wild Fauna and Flora for addition of Batagur Kachuga species to Appendix I from current Appendix II.
- With **illegal global pet trade, habitat loss and hydrological projects** threatening the existence of already endangered **Red-crowned Roofed Turtle (Batagur Kachuga)** found in Ganga lowlands and Bangladesh.



CITES:

- India has sent the proposal ahead of the CITES' **nineteenth meeting of the Conference of the Parties at Panama City** to be held between 14 – 25 November.
- CITES is an international treaty to ensure that trade in wild animals and plants do not threaten their survival.
- CITES has three appendices. Appendix I has species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances.
- Appendix III contains species that are protected in at least one country, which has asked other CITES parties for assistance in controlling trade.

About Batagur Kachuga:

- Batagur Kachuga is protected under **Schedule I of the Indian Wildlife (Protection) Act of 1972**(amended), according to which endangered species that may only be hunted under exceptional circumstances, under license from both federal and provincial authorities.
- Batagur Kachuga is **currently part of Appendix II of CITES** that has species not necessarily threatened with extinction, but in which trade must be controlled to avoid utilisation incompatible with their survival.

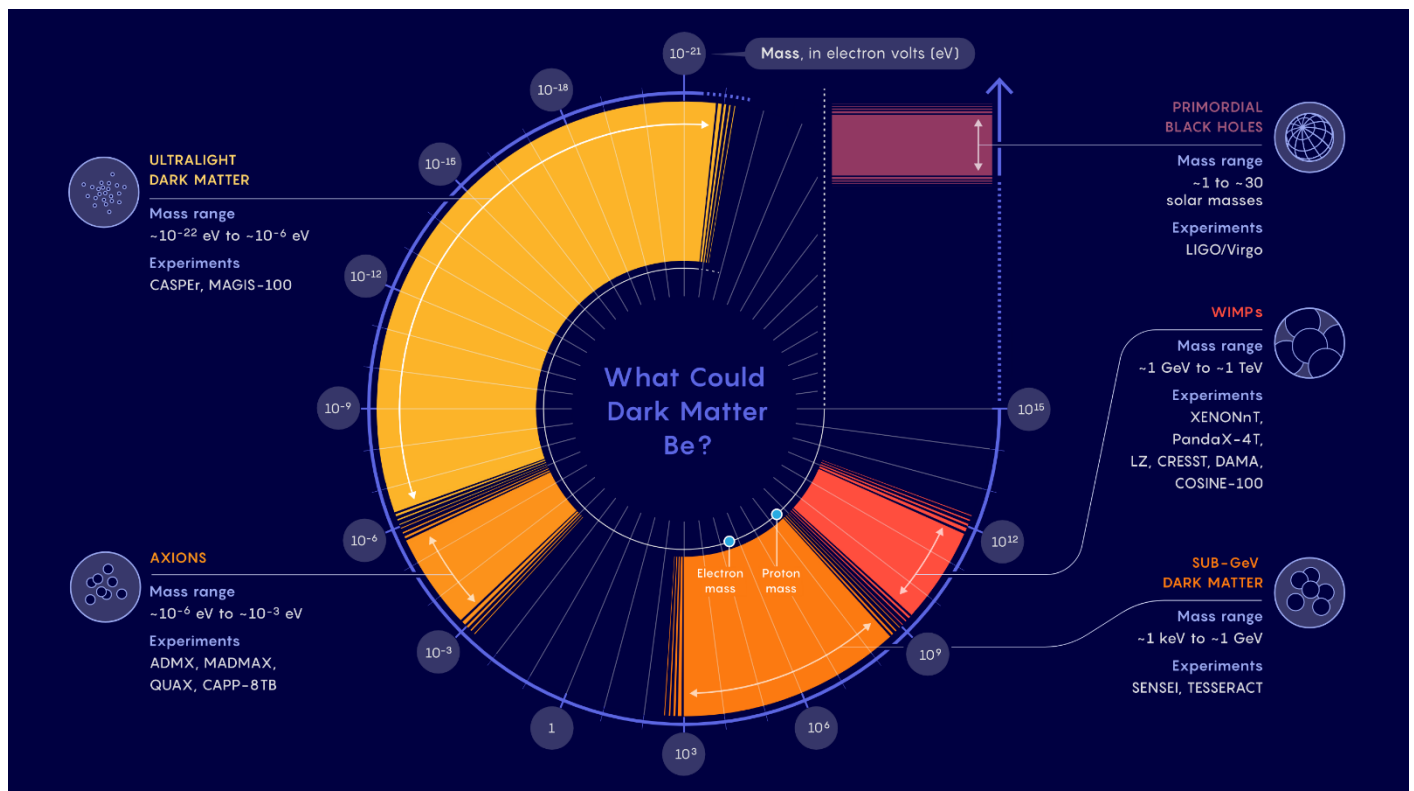
Threats:

- *B. kachuga* is or **may be affected by trade** because live specimens of the species, particularly males, are recorded to have been found in international trade and recent records show that trade is ongoing.
- Due to the ongoing decline in the species' population and continued threats to the species, both of which are expected to continue into the future, any trade in the species will have a detrimental impact on its status.
- It is a **large, exploited riverine turtle** with selective habitat requirements, slow recruitment (generation time estimated over 25 years) and threatened by exploitation **for consumption, international pet trade** due to its brilliant coloration, and systemic impacts on its main river habitat, which have been documented to have caused steep population declines, India submitted in the proposal.
- This species is now only known with certainty to exist in National Chambal Sanctuary, with 50 nests over 100 km.
- It is likely to be extinct now in Bangladesh. As a main river turtle, the species is highly susceptible to major hydrological projects and their impacts on river flow dynamics, nesting beaches, and water pollution.

The search for dark matter (GS Paper 3, Science and Tech)

Context:

- Many physicists strongly believe that the **entire visible part of the universe forms only 5% of all matter** in it. They believe the rest is made up of dark matter and dark energy.
- The latest to hit the news in the field of dark matter is a dark matter detector experiment **named LUX-ZEPLIN (LZ) in South Dakota in the U.S.**



Details:

- As of today this is the **most sensitive dark matter detector** in the world.
- To give an idea of the degree of difficulty in measuring evidence of a dark particle, it is said that the chamber of this LZ detector, can contain only one gram of dust if it is to detect a dark matter particle.
- This is the extent to which researchers have to go to rule out unwanted signals coming from other entities.

What is dark matter and why is it so elusive?

- All interactions in the universe are a result of **four fundamental forces acting on particles** — **strong nuclear force, weak nuclear force, electromagnetic force and gravitation.**
- **Dark matter is made up of particles that do not have a charge**, which means they do not interact through electromagnetic interactions. So, these are particles that are “dark”, namely because **they do not emit light**, which is an electromagnetic phenomenon, and “matter” because they possess mass like normal matter and hence interact through gravity.
- **Gravitational force**, besides not being fully integrated and understood by particle physicists, **is extremely weak.** For one thing, a particle that interacts so weakly becomes rather elusive to detect. This is because interactions from other known particles could drown out signals of dark matter particles.

Why do physicists believe strongly that dark matter exists?

- There is **strong indirect evidence for dark matter**, and this evidence is reflected at various levels (or distance scales, as physicists would explain).
- At the shortest distance scale, consider the rotation of galaxies. If stars are looked at all the way from the centre of any galaxy to its rim, the way the velocities of the observed stars change may be plotted. In the lab this same function may be plotted on a graph by assuming the visible matter is all that exists.
- There is a marked difference between the observed plot of star speeds and the calculated value as you move from the inner part of the galaxy towards its rim.
- Now if it is assumed that there is a certain fraction of matter which exerts a gravitational pull on the rest of the stars in the galaxy, for it cannot be seen in any other way, and recalculate the plot, it fits in with the observed value. This means that there is a definite amount of dark matter in the galaxy.
- One may argue that it is the model that is at fault and there is some other way to reconcile this discrepancy between the calculated and observed value of velocities in rotating galaxies. This is where evidence from other distance scales comes up.

What are the evidences from other distance scales?

- The universe can be observed at various levels — at the level of electrons and nuclei or atoms, or galaxies, or galaxy clusters, or even larger distances where the entire universe can be mapped and studied. Cosmologists, people who study the physics of the universe, typically work in the last mentioned three scales, and particle physicists study the lowest and even smaller scales.

Bullet cluster of galaxies:

- In this context, the second evidence came from observations of the so-called **Bullet cluster of galaxies**. The Bullet cluster is formed through the **merging of two galaxy clusters**.
- Physicists found from their calculations that the way these mergers took place could not be fully explained if we believed that the visible universe were all that existed. Therefore, there should be something like dark matter as well as an estimate of how much dark matter there should be in the universe.
- Similar arguments exist from mappings of the universe such as the **Sloan Digital Sky Survey** and studies of the filamentous nature of the universe at a closer look. While fixing the model could help explain away one of these discrepancies, not all of them can be explained in the same manner. Hence physicists now take the concept of dark matter very seriously.

What are the candidates for dark matter particles?

- The neutrino would have been an excellent candidate if it had been more massive.
- Other postulated entities include the **supersymmetric partner of the Z boson**, a particle that mediates the electro-weak interaction.
- Yet other explanations talk about “**hidden sector particles**” and **Axions**, a boson and a condensate of dark matter. There are many other theories.
- The search is on to find one of these candidates, for the story is one that spins together gravity, supersymmetry, hidden worlds and is the stuff of which science fiction is made.

The new guidelines to prevent unfair trade practices

(GS Paper 2, Governance)

Why in news?

- Recently, the Central Consumer Protection Authority (CCPA) announced **five guidelines to prevent unfair trade practices** and to protect consumer interests regarding the levy of service charges in hotels and restaurants.
- The guidelines are **in addition to the Centre's 2017 guidelines** which prohibit the levy of service charges on consumers by hotels and restaurants, and terms the charging for anything other than “the prices displayed on the menu card along with the applicable taxes” without “express consent” of the customer as “unfair trade practices”.



What are the powers of the CCPA?

- The CCPA has been established to regulate **matters related to the violation of the rights of consumers**. Under the Consumer Protection Act (CPA), 2019, the authority was established to regulate violations of consumer rights, unfair trade practices, and false or misleading advertisements that are prejudicial to the interest of the public.
- The CCPA has **authority under section 18 of the CPA, 2019 to protect, promote** and most importantly enforce the rights of the consumers and prevent violation of their rights under the Act.
- It also seeks to ensure that no person engages in unfair trade practices. It is also empowered to issue guidelines to enforce the rights of the consumers laid down in the Act.
- The authority has issued a letter to the Chief Secretaries of the States on service charge imposition, asking them to ensure compliance with the new guidelines on service charges.
- It has also been said that the State should instruct all the district magistrates to take appropriate action against violations of the guideline.

What is a service charge?

- A service charge is a **tip or a direct transaction** between the customer and the restaurant staff, specifically the wait staff.
- It is a fee collected to pay for services associated with the purchase of a primary product or service.
- It is collected by hospitality sectors and food and beverage industries as a fee for serving customers.

What do the new guidelines specify?

- As per the new guidelines, hotels or restaurants are prohibited from levying extra charges automatically or by default in the bill or by any other name.
- Also, they are not allowed to force service charges, and must clearly inform the consumers that service charges are voluntary, optional, and at their discretion.
- Most importantly, hotels and restaurants are no longer allowed to restrict entry or services based on the collection of service charges. Furthermore, hotels cannot add service charges to their bills and charge GST on the total.
- It is entirely up to the consumer to decide whether or not to tip. If a consumer enters a restaurant or orders something, the restaurant policy cannot require them to tip. Therefore, consumers cannot be forced to pay a service charge without having the choice to decide whether they want to do so.

Why were new guidelines issued?

- The CCPA has taken cognisance of various grievances that were registered on the National Consumer Helpline (NCH) related to the unnecessary levying of service charges in the bill. Usually, this charge is levied in addition to the total price of the food items mentioned on the menu and applicable taxes, often in the guise of some other fee.
- The said guidelines now consider charging a customer other than the price of food items displayed on the menu along with applicable taxes, as an 'unfair trade practice' under the CPA.
- In general, the price of any product covers both the cost of the product and the cost of the service. This implies that the price of food and beverages served in the hotels and restaurants includes the price of the 'service'.
- There is no restriction on hotels or restaurants to set the prices at which they want to offer food or beverages to consumers. Placing an order involves consent to pay only the prices of food items displayed on the menu along with applicable taxes. Charging anything other than the said amount would amount to 'unfair trade practice' under the Act.

What are the redressal mechanisms?

- If any consumer finds that a hotel or restaurant is levying a service charge in violation of these guidelines, they may **request the concerned hotel or restaurant to remove the service charge** from the bill or may **lodge a complaint on the NCH**, which works as an alternate dispute redressal mechanism at the pre-litigation level by calling 1915 or through the NCH mobile app.
- A complaint may also be filed against **unfair trade practice with the Consumer Commission electronically** for its speedy and effective redressal.
- As a result of these new guidelines, consumers will no longer be subject to involuntary payments under the heading of 'service tax'. However, it will be interesting to observe the effective compliance of these guidelines by restaurants since levying a service charge has become an 'accepted trade practice' in India.