The Defenders: Artificial Intelligence

For Prelims: Artificial Intelligence, Human intelligence

For Mains: Importance of Artificial Intelligence in Defence

What is Artificial Intelligence?

- It describes the **action of machines accomplishing tasks that have historically required human intelligence.**
- It **includes technologies** like machine learning, pattern recognition, big data, neural networks, self algorithms etc.
- The origin of the concept can be traced back to Greek mythology, although it is only during modern history when stored program electronic computers were developed.
    - **Example:** Millions of algorithms and codes are there around the humans to understand their commands and perform human-like tasks. Facebook's list of suggested friends for its users, a pop-up page, telling about an upcoming sale of the favourite brand of shoes and clothes, that comes on screen while browsing the internet, are the work of artificial intelligence.
- **A Complex Technology:** AI involves complex things such as feeding a particular data into the machine and making it react as per the different situations. It is basically about creating self-learning patterns where the machine can give answers to the never answered questions like a human would ever do.

What is the Significance of Artificial Intelligence in Defence?

- **Logistics and Supply Chain Management.**
    - This is the lowest hanging fruit, one which will show immediate results, and drive up the efficiency of the military.
    - It could also **provide a boost to private sector involvement in this space,** by helping lay a foundation of trust for deeper engagement with the Indian military.
    - There already exists significant expertise within the civilian sector on deploying AI for logistics and supply chain management, which can be easily transferred to the military domain.
- **Data Management and Enhanced ISR (Intelligence, Surveillance, and Reconnaissance) Capabilities:**
    - The Indian military obtains vast amounts of data every day, a significant part of which might often be unused or underused.
    - AI can be **used to process this data to provide more actionable intelligence** for the Indian armed forces.
    - This also has the **capability of providing greater on-field support for human warfighters.**
        - A good example of such use of AI is Project Maven in the United States, where machine learning algorithms are used to sift through the massive amounts of video

data the U.S military collects and provide credible intelligence for use in counter-insurgency operations.
    - AI systems could also **prove to be valuable in physical ISR, especially in harsh terrains and weather conditions.**
        - This could be the high Himalayas bordering Pakistan and China, or undersea patrolling in the Indian Ocean. Such systems, whether manned or unmanned, will allow the forces to scout the battlefield without danger to human soldiers.
- **Weapon Systems:**
    - AI can **enhance the efficacy of existing weapon systems** and even lead to an entire new class of weapons.
        - This is arguably the most controversial potential use of AI in military operations.
    - The use of AI in weapon systems has the **potential to lead to the development of autonomous weapons,** which are weapons that can theoretically choose and engage targets without human intervention.
- **Cybersecurity:**
    - This can be **used both for ISR activities and as a weapon system** (whether offensive or defensive).
    - Cyber operations, especially those that are defensive in nature, are also a relatively low-hanging fruit that could considerably enhance current capabilities.
    - **Trained AI systems could prove to be far more efficient than humans** in ferreting out cyber-threats and responding to them.
    - As cyberwarfare becomes increasingly faster, more sophisticated, and more dangerous, it is unlikely that humans will be able to tackle evolving threats in an effective manner by themselves.

What are the Challenges with the AI-based Application for Military Purposes?

- **Data and Privacy:**
    - There may be trade-offs between privacy and prosperity when it comes to protecting personal data in the AI environment.
- **Ethical Risks:**
    - Ethical risks are **important from a humanitarian standpoint.**
    - As AI advances, the ethical considerations and governance issues may be redefining regulations and governance in ways that address fairness, safety, reliability, privacy, inclusivity, transparency, and accountability.
- **Strategic Risks:**
    - Strategic risks include the **possibility that AI will increase the likelihood of war, escalate ongoing conflicts,** and proliferate to malicious actors.
- **Harm to Human Beings:**
    - AI systems **can be purposefully programmed to cause death or destruction**, either by the users themselves or through an attack on the system by an adversary.
    - Unintended harm can also **result from inevitable margins of error** which can exist or occur even after rigorous testing and proofing of the AI system according to applicable guidelines.
- **Bias Decision:**
    - AI can **perpetuate biases either unintentionally or intentionally** and can be vulnerable to attack or hacking.
    - Since these systems are often trained on large datasets, they tend to replicate the same biases that were present in the original datasets.
        - Similarly, personal biases of developers of algorithms may further add to this problem.

What are the Related Initiatives taken?

- **Task Force for Implementation:**
    - N Chandrasekaran Task Force was set up in 2018 to study implications of AI in national security.
    - Based on the recommendations of the aforesaid Task Force, Defence AI Council (DAIC) and Defence AI Project Agency (DAIPA) was created.

        - DAIPA aims for greater thrust on **Artificial Intelligence (AI)** in Defence, formulation of an AI roadmap for each Defence PSU and Ordnance Factory Board to develop AI-enable products.
        - DAIC has been set up to **provide necessary guidance and structural support** for application of AI for use by the military.
- **Defence India Startup Challenge:**
    - The Defence India Startup Challenge under the Innovations for Defence Excellence (iDEX) programme aims to **fund** startups **that address AI, sophisticated imaging, sensor systems, big data analytics**, autonomous unmanned systems, and secure communication systems, among other technologies for the defence forces.
- **AIDef Symposium and Exhibition:**
    - The Ministry of Defence recently **launched 75 newly-developed Artificial Intelligence (AI) products/technologies** during the first-ever 'AI in Defence' (AIDef) symposium and exhibition.
    - The AIDef symposium and exhibition was organised by the Department of Defence Production under the Ministry of Defence, as a part of **Azadi Ka Amrit Mahotsav.**
    - It sought to promote “Aatmanirbharta” in Defence sector.

Way Forward

- **Set-up Processes and Practices:**
    - To make effective use of AI in the Military, it is important for the Indian Defence Ministry to set up processes and practices that allow it to work with research labs, academia, startups and the private sector.
- **Maintaining Balance:**
    - A good balance has to be **made between what can be done in-house and what external partnerships can be struck.**
    - In doing so, the **Indian Military will take advantage of cutting edge work and best practices,** while maintaining the integrity and secrecy that is required in the circumstances.
- **Role of Private Sector:**
    - The **role of the private sector will be pivotal in making AI accessible** and efficient.
    - As AI demands high-skills and capital, innovations need an ecosystem supporting the free flow of both money and skill.
- **Robust Hardware and Enabling Data Banks:**
    - As AI runs complex algorithms on loads of data, **it is essential to have robust hardware and enabling data banks** within the country.
        - The **lack of critical infrastructure is one of the biggest impediments** in the prospects of AI in India for both civilian and military uses.
    - If a critical AI-based military technology harnesses the data on a remote server located beyond the borders, **it can potentially hinder the goal of Indian foreign policy** from preserving its strategic autonomy in a way that it might be compromised.

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)

Exp:

- Google is using the Internet of Things (IoT) and Artificial Intelligence (AI) from its DeepMind acquisition to reduce energy consumption in its data centres by as much as 30%. **Hence, 1 is correct.**
- Using AI as a tool to make music or aid musicians has been in practice for quite some time. In the 1990s, David Bowie helped develop the Verbasizer, which took literary source material and randomly reordered the words to create new combinations that could be used as lyrics. However, as AI works in programmed ecosystem and does not have emotions so it would be hard for an AI to create meaningful short stories and songs. **Hence, 2 is not correct.**
- AI combined with robotics and the Internet of Medical Things (IoMT) could potentially be the new nervous system for healthcare, presenting solutions to address healthcare problems. Integration of AI technology in cancer care could improve the accuracy and speed of diagnosis, aid clinical decision-making, and lead to better health outcomes. **Hence, 3 is correct.**
- Speech synthesis is the artificial production of human speech. It is a way to convert language to human voice (or speech). For example, Google's Assistant, Amazon's Echo, Apple's Siri, etc. **Hence, 4 is correct.**
- Potential cases of AI's use in the energy sector include energy system modelling and forecasting to decrease unpredictability and increase efficiency in power balancing and usage. However, it cannot be used for transmission of electrical energy. Hence, 5 is not correct. Therefore, option (b) is the correct answer