

# Artificial Intelligence in Defense Sector

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**Abstract** - Artificial Intelligence is a new branch of computer science, it is also termed as machine Intelligence that gathers information to stimulate and build a machine to perform task that normally requires human behavior. The AI has a goal to reach i.e. "Strong AI" and it will be similar, to some extent, identical to human being. Artificial Intelligence applications are rapidly growing and have taken entire world's governments attention towards the Military applications. Artificial Intelligence applications are rapidly growing and have taken entire world's governments attention towards the Military applications. Generic programming and neural networks are used to develop AI algorithms, which can be further used to develop Military Applications for devices that can find bombs and mines, and different radars, submarines, missiles etc.

**Key Words:** Artificial Intelligence, AI, India, DRDO, UAV, UMV, DARPA, CAIR.

## 1. INTRODUCTION:

What is AI?

[1] According to the father of Artificial Intelligence, John McCarthy, it is "The science and engineering of making intelligent machines, especially intelligent computer programs". "Artificial Intelligence" term was first coined in 1956 by Prof. John McCarthy.

[2] AI is widely used in many sectors such as economy, mapping technologies, financial, surveillance, smart vehicles, developing robots that are used in medical, industrial and military task such as:

1. Unmanned Ground Vehicles (UGV)
2. Unmanned Aerial Vehicles (UAV)
3. Unmanned Aircraft System (UAS)
4. Unmanned Sea Vehicles (USV)
5. Mini Robot Machines.

### 1.1 Overview of Artificial Intelligence Globally.

[3] United States of America (USA) and China are highly focused in developing military applications using Artificial Intelligence.

#### China

In China the overall progress for technology and its applications of AI are leading with the advanced level throughout the world. China is highly progressing to achieve the next generation of Artificial Intelligence using the applications of Big-Data, Neural Networking and autonomous intelligent systems. China has exceeded its budget for AI

above \$25 billion and has a vision to establish the modules for laws, regulations and policy.

China has a mission by 2025, to reach a leading level in AI for the betterment of china's economic transformation. The CETGC in china has successfully passed a flight test for Sworn of 119 drones holding a new record in June, 2017. Artificial Intelligence in china is on the high-level priority as they are involved in Sworn Intelligence among distribution of Robots and also to take full advantage of private sector progress in AI to enhance its military capabilities.

#### USA

The Government of USA has highly invested above \$17.9 Billion towards the growth for the next stage in warfare using the concept of AI. Next Generation advanced concept such as Electronic wearable combat apps, Motherships of Drones releasing Small - Micro Drones through air and Sea, such operations are being tested at MIT's C.S and A.I Labs. One of the largest sources of funding for AI research came from the Defense Advanced Research Project Agency (DARPA) U.S, which is agency of the Department of Defense of the United States of America. DARPA provides the development of new technologies for use by the military. The Department of Defense of the United States of America (DARPA) has Virtual Machine Reality (VMR) system used in intelligence analysts in searching, filtering, and exploring visual media through the use of advanced computer vision and reasoning techniques.

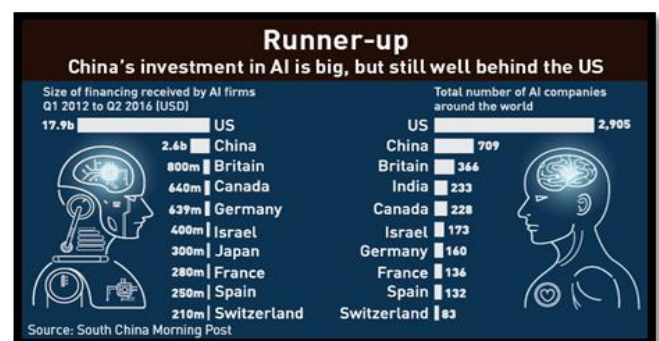


Figure 1: Investment for AI Globally

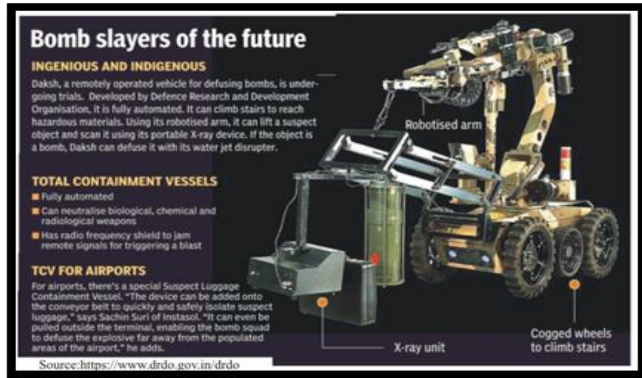
## 2. ARTIFICIAL INTELLIGENCE IN INDIAN DEFENSE SYSTEM:

Artificial Intelligence in India is mainly used in commercial sector and growing rapidly in defense sector. Artificial Intelligence with Robotics combination is transforming India in the application of social, defense and economics fields. India has more than 233 AI companies that are working in

different sectors of AI such as Gaming, Aerospace, Social, Military etc.

**AI with Robotics in Indian defense:**

The Defense Research and Development Organization, India (DRDO) is highly emerged in AI technological activities, Indian army has DAKSH Robots that are used to defuse explosive that are categorized under Remotely operated vehicles (ROV), there are more than 200 ROV in Indian Military Sector.



**Figure 2: DAKSH**

India and Japan will be working together in the field of AI with Robotics in the Military Sector to enhance the next level in the world of Artificial intelligence.

Apart from this the cooperation is to develop unmanned ground vehicles (UGV), unmanned Aerial Vehicles (AUV), bomb and missile systems, smart ammunitions and robotics etc.

Indian defense system is highly focused in development of Remotely Operated Vehicles (ROV), DAKSH for diffusion and disposal of Bomb, UAV, RUSTOM, NETRA (The Game Changer in Warfare etc.) and various mini robots.



**Figure 3: NETRA**



**Figure 4: Indian Army Soldiers look at a Rustom-1 unarmed air vehicle during a Defense Research and Development Organization (DRDO) exhibition in Chennai on July 28, 2017.**

**Indian National Infrastructure for AI:**

The Indian AI for defense sector is undertaken by CAIR. The Current Annual Revenue for AI in India is \$180 Million.

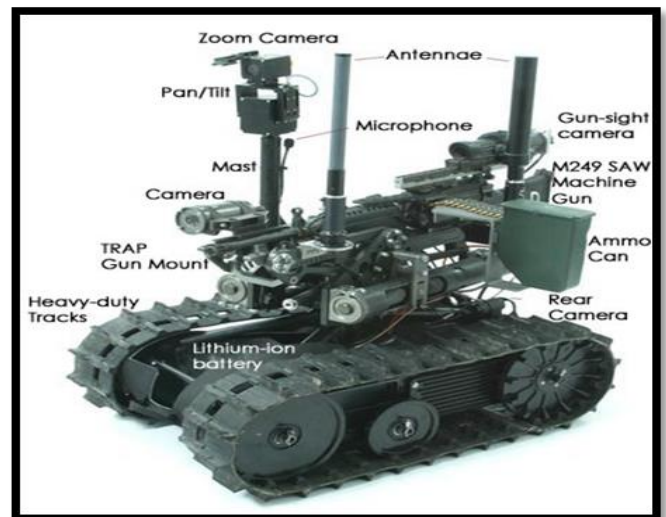
India is tremendously moving in the race for AI with More than 29,000 AI professionals having experience of average 6.6 years

**3. WARFARE DEVELOPED USING AI: TALON (S.W.O.R.D.S):**

TALON is military robot developed by Foster-Miller and it is owned by QinetiQ North American Company.

TALON is highly used in US Army to protect the War-Crafts, War-Fighters, Artilleries, and against explosive threats.

TALON Supports operations such as SWAT and Military Police. In April 2007 The Naval Explosive Ordnance Disposal Technology Division signed a contract for 151 TALON worth \$26 Million. US Army and Navy has invested \$58.5 Million for getting more TALONs in Dec 2008 to QinetiQ. [4]



**Figure 5: TALON**

#### 4. INDIAN ARMY'S STEP IN ARTIFICIAL INTELLIGENCE:

[5] India has highly emerged in parallel to equipping nations' armed forces with up-to-date artificial intelligence (AI) and robots.

Center for Artificial Intelligence & Robotics (CAIR) is leading research in artificial intelligence for Indian defense sector. CAIR has already developed numerous myriad of robots with various applications.

CAIR is currently working on a project to develop a Multi Agent Robotics Framework (MARF). MARF is designed to provide India's armed forces with a group of robots that can function as a team, similar to soldiers. The AI in India has various architecture capable of providing array of military applications, and will have collaboration amongst a team of various robots where Indian Army has already built – Wheeled Robot with Grip Suspension, Snake Robot, Humanoid Robot, Wall-Climbing Robot, and Robot Sentry, among others.



Figure 6: MARF

CAIR is developing intelligent mobile robots that are specifically designed for Indian Armed Forces that will be used to assist with self-reliant, adaptable for executing operations in various conditions including both environmental and terrain.

#### 5. RESULTS:-

India is fastest growing economy with new technologies for industrial, economy and defense sector.

India need to develop artificial intelligence (AI)-powered weapon and surveillance systems for futuristic wars.

India to guard the long border with Pakistan and China can be done easily by developing humanoid robots with armed

weapons, unmanned tanks, submarines and aircraft that can be used for military war with enemies, since India does not have aerial combat drones for defense. The country's defense establishment is directly working towards harnessing the expertise of the information technology industry and academe in this area, working parallelly with countries like the US and China that are highly focused on Artificial Intelligence and Machine Learning to develop Lethal Autonomous Weapon Systems (LAWS).

[6] India also needs to take awareness of the entire ethical debate on Lethal Autonomous Weapon Systems (LAWS), because authorities can make debate or argue that they could violate humanitarian principles and can also destroy targets without human intervention.

#### 6. FUTURE IMPLEMENTATION

The Indian Armed Forces is widely working with CAIR on development of Multi Agent Robotics Framework (MARF). These Robots includes the Snake, the legged Robot, the Wall Climber and the Unmanned Ground Vehicles. Apart from these they need to jointly focus on the following:-

Image interpretation for target identification and classification. AI techniques could automate the extraction of low level map features from imagery.

Systems for diagnosis and maintenance of sophisticated weapon systems.

Missiles – the objective range and direction examination for assessment of kill zones and dispatch time and reproduction to help with qualifying missiles execution in different situations.

Upgraded utilization of robots for hostile to Improvised Explosive Device, extraction of work force, shooting of firearms and different applications.

The whole procedure would bring about modernization of different capacities subsequently improving operational effectiveness.

The Indian Armed Forces need to apply AI to enhance working in the front line and enhance its operational readiness. An unequivocal technique should be drawn at the Service Headquarters for its successful usage.

#### 7. CONCLUSION

The long term vision for military part of AI is the center for advancement, innovation and development.

This Vision can help Indian government to cover various field of AI such as Autonomous weapons and the role of AI in cyber-defense and also would most benefit the country.

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Fig 6. MARF [DRDO]