1. What is Artificial Intelligence (AI)? Who are currently the big players in the field of AI? How big is the potential of AI? Discuss.

Approach

Define in introduction what is artificial intelligence.In next part mention some big players and what are their works in this field.In last part discuss what are the potential of AI in various sectors.

Introduction:

Artificial intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think like humans and mimic their actions. The term may also be applied to any machine that exhibits traits associated with a human mind such as learning and problem-solving.

Body

Big Players in Artificial intelligence

- Amazon: Trade giant Amazon has invested in both the consumer-oriented side of AI and in applications for companies and their processes. Alexa, the company's AI language assistant, integrated into its echo speaker series, is well-known worldwide. However, Amazon Web Services (AWS), a set of machine learning programs and pre-trained AI services for businesses, hasn't yet done so much. AWS currently has more than 10,000 customers, including Siemens, Netflix, Tinder, NFL, and NASA.
- Apple: Apple has been busy acquiring AI start-ups in recent years and sees Artificial Intelligence as a critical part of its future. In December 2018, the company officially appointed John Giannandrea as head of the AI and Machine Learning department after Google poached the Scottish computer scientist.
- DJI: The first Chinese company on the list, DJI, is still officially a start-up but has already been valued at 15 billion dollars. The company has a market share of more than 70 percent in the global drone market and is increasingly entering the AI market. The latest drones use AI and image recognition to avoid objects. Soon, an entry into autonomous vehicles and robotics can be expected. DJI has recently entered into a partnership with Microsoft for a drone-to-computer streaming project.
- Facebook: Artificial intelligence will be enormously powerful in the future. So it's no surprise that Facebook is investing in AI. Facebook's AI research group, known as FAIR, says it is committed to advancing the field of machine intelligence and developing new technologies to provide people with better ways to communicate. Mark Zuckerberg and Co. worked on a negotiation platform with two AIs called Alice and Bob, among other things, but ended the project after the couple began communicating in their secret language.
- Google: Perhaps the largest and most important AI company on this list is also the most obvious. Google has acquired AI start-ups as if there were going to

be no more soon. Over the past four years, Mountain View has created no fewer than twelve new artificial intelligence companies. The most important purchase was the $400 million deal for DeepMind, the board game playing Go champion.

- HiSilicon: When Huawei CEO Richard Yu unveiled the Kirin 980 at IFA 2018 in Berlin, the competition was very keen. HiSilicon, Huawei's chip manufacturer, has significantly enhanced the second generation of the world's first AI smartphone chip. The Kirin 980 can do things like face recognition, object recognition, image segmentation, and intelligent translation at high speed. The chip has sparked a flood of AI smartphone chips, and if a company is going to develop the technology further in the next few years, it probably will.
- IBM: The multinational technology company IBM has been active in AI since the 1950s. The company was involved in the birth of artificial intelligence and is still firmly committed today. With Watson, IBM has created a machine learning platform that can integrate AI into business processes, such as building a chatbot for customer support. Customers include Big Four Auditor, KPMG and Bradesco, one of Brazil's largest banks.
- Intel : Intel has also been on a shopping spree when it comes to artificial intelligence companies and has acquired both Nervana and Movidius as well as a selection of smaller AI start-ups. Nervana enables companies to develop specific deep learning software, while Movidius was founded to bring AI applications to devices with deficient performance. Intel is also working with Microsoft to provide AI acceleration for the Bing search engine.
- Microsoft: Like Amazon, Microsoft is involved in Artificial Intelligence on both the consumer and business sides. Cortana, Microsoft's AI digital assistant, is in direct competition with Alexa, Siri, and Google Assistant. Artificial Intelligence features are a large part of the company's Azure Cloud service, which provides chatbots and machine learning services to some of the biggest names in the business. Microsoft also purchased five AI companies in 2018 alone.

Potential applications of Artificial intelligence

- Online shopping and advertising – Artificial intelligence is widely used to provide personalised recommendations to people, based for example on their previous searches and purchases or other online behaviour. AI is hugely important in commerce: optimising products, planning inventory, logistics etc.
- Web search – Search engines learn from the vast input of data, provided by their users to provide relevant search results.
- Digital personal assistants – Smartphones use AI to provide services that are as relevant and personalised as possible. Virtual assistants answering questions, providing recommendations and helping organise daily routines have become ubiquitous.
- Machine translations – Language translation software, either based on written or spoken text, relies on artificial intelligence to provide and improve translations. This also applies to functions such as automated subtitling.

- Smart homes, cities and infrastructure – Smart thermostats learn from our behaviour to save energy, while developers of smart cities hope to regulate traffic to improve connectivity and reduce traffic jams.
- Automobiles – While self-driving vehicles are not yet standard, cars already use AI-powered safety functions. The EU has for example helped to fund VI-DAS, automated sensors that detect possible dangerous situations and accidents. Navigation is largely AI-powered.
- Cybersecurity – AI systems can help recognise and fight cyberattacks and other cyber threats based on the continuous input of data, recognising patterns and backtracking the attacks.
- Artificial intelligence against Covid-19 – In the case of Covid-19, AI has been used in thermal imaging in airports and elsewhere. In medicine it can help recognise infection from computerised tomography lung scans. It has also been used to provide data to track the spread of the disease.
- Fighting disinformation – Certain AI applications can detect fake news and disinformationby mining social media information, looking for words that are sensational or alarming and identifying which online sources are deemed authoritative.
- Health – Researchers are studying how to use AI to analyse large quantities of health data and discover patterns that could lead to new discoveries in medicine and ways to improve individual diagnostics. Brain-computer interfaces (BCIs) backed by artificial intelligence helps to treat neurological diseases and trauma to the nervous system, helps in developing next generation radiology tools such as PET-SCAN, CT-SCANS etc.
- Transport – AI could improve the safety, speed and efficiency of rail traffic by minimising wheel friction, maximising speed and enabling autonomous driving. Tesla Cars uses AI.
- Agriculture – AI applications in agriculture have developed applications and tools which help farmers inaccurate and controlled farming by providing them proper guidance to farmers about water management, crop rotation, timely harvesting, type of crop to be grown, optimum planting, pest control etc. use of drone to analyze the captured images and provide a detailed report containing the current health of the farm. It helps the farmer to identify pests and bacteria helping farmers to timely use of pest control and other methods to take required action.
- AI Robotics in Agriculture – AI companies are developing robots that can easily perform multiple tasks in farming fields. This type of robot is trained to control weeds and harvest crops at a faster pace with higher volumes compared to humans. These types of robots are trained to check the quality of crops and detect weed with picking and packing of crops at the same time.

Conclusion

Artificial intelligence is an objective tool which has its positive and negative side.Its upto individuals, companies and governments to decide on how to utilise this scientific tool for better of humanity.In context of India AI can be used to alleviate the problems

concerning agrarian distress, climate change, education gap, and governance.Therefore Artificial intelligence should be used to overcome the problems which are faced by present society.

2. How does a communication satellite work? Illustrate. Also examine the applications of GSAT series of satellites developed by ISRO.

Approach

Define what are communication satellites.In next part explain their working with help of some examples.In last part explain what are the application of GSAT satellites launched by India.

Introduction

A communications satellite is an artificial satellite that relays and amplifies radio telecommunication signals via a transponder; it creates a communication channel between a source transmitter and a receiver at different locations on Earth. Communications satellites are used for television, telephone, radio, internet, and military applications. The GSAT (Geostationary Satellite) satellites are India's indigenously developed communications satellites, used for digital audio, data and video broadcasting.

Body:

Working of a Communication satellite

- A communications satellite is an artificial satellite that relays and amplifies radio telecommunications signals through a transponder. It basically creates a communication channel between a source transmitter and a receiver at different locations on earth.
- Communications satellites are used for television, telephone, radio, internet, and military applications. There are currently 2,134 communications satellites in the earth's orbit and these comprise both private and government organizations. Several are in geostationary orbit 22,236 miles (35,785 km) above the equator, so that the satellite appears stationary at the same point in the sky.
- The orbital period of these satellites is the same as the rotation rate of the Earth, which in turn allows the satellite dish antennas of ground stations to be aimed permanently at that spot; they do not have to move along and track it.
- Since the high frequency radio waves used for telecommunications links travel by line of sight, they get obstructed by the curve of the earth. What these communications satellites do is they relay the signal around the curve of the earth thus making possible communication between widely removed geographical points.
- Communications satellites use a wide range of radio and microwave frequencies. To avoid signal interference, international organizations have regulations stating which frequency ranges (or bands) certain organizations are permitted to use. This allocation of bands reduces the chances of signal interference.

Application of GSAT series of satellite

- A multi-media mobile satellite system; will offer a Satellite Digital Multimedia Broadcasting (S-DMB) service, via mobile phones and mobile video/audio receivers for vehicles; Can also be utilized for strategic and social applications.
- According to defense experts,GSAT-7 will enable the Indian Navy to acquire blue water capabilities and need not depend on foreign satellites like Inmarsat, which provide communication services to its ships.
- GSAT-7A is an advanced military communications satellite meant exclusively for the Indian Air Force.
- GSAT 8 will augment the capacity in the INSAT system; The GAGAN payload provides the Satellite Based Augmentation System (SBAS), through which the accuracy of the positioning information obtained from the IRNSS Satellites is improved by a network of ground-based receivers and made available to the users in the country through the geostationary satellites.
- GSAT 9 Carried GAGAN navigation payload, a regional navigational services by NAVIC, a navigational system developed by India, that provides navigational services to the security forces and air traffic control organizations.
- GSAT 10 Will augment telecommunication, Direct-To-Home and radio navigation services.
- GSAT 12 Replacement of the INSAT-3B; to provide services like tele-education, tele-medicine, disaster management support and satellite internet access.
- Military communications which helps intelligence agencies handle day to day work of all the forces and especially prepare for war like situations.

Conclusion

India has achieved great success in space frontiers with IRSO at its helm.The GSAT series of satellites has reduced India's dependance on critical infrastructure which is important for military communication, e governance, online education, telemedicine, telecommunications and new age application such as precision farming.This will help India to reduce poverty, enhance skill development and also augment soft power with ability to help neighbouring countries.

3. Discuss oil spill as an environmental hazard. What are its remedies?

Approach

First define what is meant by oil spill.In next part write how it is an environmental hazard and at last write the remedies to overcome oil spills.Make use of examples for better impact.

Introduction

Oil is among the most important energy sources in the world and because of its uneven distribution, it is transported by ships across the oceans and by pipelines across the lands. This has resulted in several accidents in the past while transferring the oil to vessels, during transportation, breaking of pipelines, as well as while drilling in the earth's crust.While massive and catastrophic spills receive most of the attention, smaller and chronic ones occur on a regular basis. These spills contaminate the coasts and estuaries and can cause serious health problems to human beings

Body

Impacts of oil spill on environment
On Marine life

- The most affected organisms are those which floats near the surface like turtles, fishes, crabs etc.
- Sea animals caught in an oil spill, on being exposed to toxic petroleum products often results in lower reproductive rates, organ damage, and death. The effects remain for a long period of time.
- Fishes die due to inability to swim or breath.
- Note: This time was core breeding period for olive ridley turtles and due to oil slick sticking to the gut mother turtles may find it difficult to lay the eggs.

On Birds

- Many birds die due to drowning or inability to eat due to oil sticking to their body.

On Humans

- Direct exposure can have varying effects depending on the toxicity and chemicals involved in the spill.
- Humans get exposed to toxicity through breathing gaseous oil compounds and/or oil compounds adsorbed on particulate matter (dispersed through the air). Exposure can also happen due to the activities in the contaminated ground (e.g., soil) or through skin absorption when touching spilled material.
- There is a huge economic cost attached with such disasters.

Remedies for oil spills
Using Oil Booms

- The use of oil booms is a very simple and popular method of controlling oil spills. Equipment called containment booms acts like a fence to prevent the oil

from further spreading or floating away. Booms float on the water surface and have three parts –

- A 'freeboard' is the part that rises above the water surface, containing the oil and preventing it from splashing over the top
- A 'skirt' is placed below the surface and keeps the oil from being squeezed under the booms and escaping
- A kind of cable or chain that connects the parts to strengthen and stabilize the boom.
- Connected sections of the boom are placed around the area of the oil spill until it is totally surrounded and contained.

Using Skimmers

- Once the oil has been confined by using oil booms, skimmers or oil scoops can be deployed onto boats to remove the contaminants from the water surface. Skimmers are machines specially designed to suck up the oil from the water surface like a vacuum cleaner. They are used to physically separate the oil from the water so that it can be collected and processed for re-use.

Using Sorbents

- Sorbents are materials that soak up liquids by either absorption (pulling in through pores) or adsorption (forming a layer on the surface). Both these properties make the process of clean-up much easier. Materials commonly used as oil sorbents are hay, peat moss, straw or vermiculite.

Burning In-situ

- In this method, the oil floating on the surface is ignited to burn it off. This in-situ burning of oil can effectively remove up to 98% of an oil spill, which is more than most of the other methods.
- According to Obi et al, (2008), "The minimum concentration (thickness) of the slick on the water surface for any measurable effectiveness of in-situ burning is 3mm. This is because it would be very difficult (and even nearly impossible) to ignite a layer which is not thick enough.

Using Dispersants

- When the spilled oil cannot be contained by using booms, the only option left is to accelerate the disintegration of oil. Dispersal agents, such as Corexit 9500, are chemicals that are sprayed upon the spill with the help of aircraft and boats, which aid the natural breakdown of oil components.
- They allow the oil to chemically bond with water by increasing the surface area of each molecule. This ensures that the slick does not travel over the surface of the water, and is easier to degrade by microbes.

Hot Water and High-Pressure Washing

- This procedure is mainly used in situations where the oil is inaccessible to methods of mechanical removal such as using booms and skimmers. It is used to dislodge the trapped and weathered oil from locations which are generally inaccessible to machinery.
- Water heaters are used to heat up water to around 170°C, which is then sprayed by hand with high-pressure wands or nozzles. The oil is thus flushed to the water surface, which can be collected with skimmers or sorbents.

Using Manual Labour

- As the name suggests, the method requires hand-held tools and manual labour to clean up the contaminants. It involves the use of manual means like hands, rakes, shovels etc. to clean the surface oil and oily debris and place them in special containers to be removed from the shoreline.Sometimes, mechanized equipment may be employed for providing any additional help and reach out to any inaccessible areas.

Bioremediation

- Bioremediation refers to the use of specific microorganisms to remove any toxic or harmful substances. There are various classes of bacteria, fungi, archaea and algae that degrade petroleum products by metabolizing and breaking them into simpler and non-toxic molecules (mostly fatty acids and carbon dioxide). Sometimes, reagents and fertilizers may be added to the area.
- These phosphorus-based and nitrogen-based fertilizers provide adequate nutrients to the microbes so that they are able to grow and multiply quickly.
- This process is generally not used when the spill has happened in the deep seas and is gradually put into action once the oil starts to approach the shoreline.

Chemical Stabilisation of oil by Elastomizers

- Right after an oil spill, the immediate concern is to prevent the oil from spreading and contaminating the adjacent areas. While mechanical methods like using oil booms effectively contain the oil, they have certain limitations to their use.
- Quite recently, experts have been using compounds like ‘Elastol’, which is basically poly iso-butylene (PIB) in a white powdered form, to confine oil spills. The compound gelatinizes or solidifies the oil on the water surface and thus keeps it from spreading or escaping. The gelatin is easy to retrieve, and this makes the process highly efficient.

Natural Recovery

- The simplest method of dealing with the oil spill cleanup operation is to make use of the vagaries of nature like the sun, the wind, the weather, tides, or naturally occurring microbes. It is used in certain cases when the shoreline is too remote or inaccessible, or the environmental impact of cleaning up a spill could potentially far outweigh the benefits.

Conclusion

Oil spills have negative impact on ecology as well as human development as it affects the livelihood of fishermen and coastal tourism.The recent oil spill in Mauritius is a case in point.Therefore the should be mor emphasis on preventing such oil spills by rigorous quality check and consanguinity upgradation of protocols.Further in country like India which have a vast coastline there should be focus to bring a specific law on this issue for better handling of such crises and punitive measures against the culprits as well as compensation to the victims.