PERSONALITY TEST PROGRAMME 2019

(Current Affairs Interview Issues)

ARTIFICIAL INTELLIGENCE

Introduction

Artificial intelligence refers to the **ability of machines to perform cognitive tasks like thinking, perceiving, learning, problem solving and decision making**. It enables computer system to carry out task on their own that otherwise requires human intelligence.

Artificial intelligence system **learns from experience, uses the learning to reason, recognises images, solves complex problems, understands languages and creates perspectives**.

The term Artificial Intelligence was first coined in **1955 by Professor John McCarthy**.

Although it has evolved overtime in the last 60 years but it recently came to the forefront with huge chunk of data being generated, advanced algorithms and high-end and faster computer systems to process them.

Examples of AI include: SIRI/Personal assistants in mobiles, chess playing computer, self-driving car etc.

Related terms

- **Machine Learning** is a subset of Artificial Intelligence and is based on algorithms that gives the ability to computers to learn from data, identify patterns and make decisions or predictions with minimal human intervention. For e.g. YouTube video recommendations.
- **Deep Learning** is the subset and next evolution of machine learning concerned with algorithms inspired by the structure and function of the brain called artificial neural networks. Like a human brain, computer can identify various features in data automatically. For e.g. speech recognition.
- The **Internet of Things** is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.
- **Big data** is high-volume, and high-velocity and/or high-variety information assets that demands cost-effective, innovative forms of information processing that enable enhanced insight, decision making, and process automation.
    - Big Data analytics helps organizations to harness their data and use it to identify new opportunities, develop smarter strategies, efficient operations, and increase returns and customer centricity.

Three ways of Human-AI Collaboration

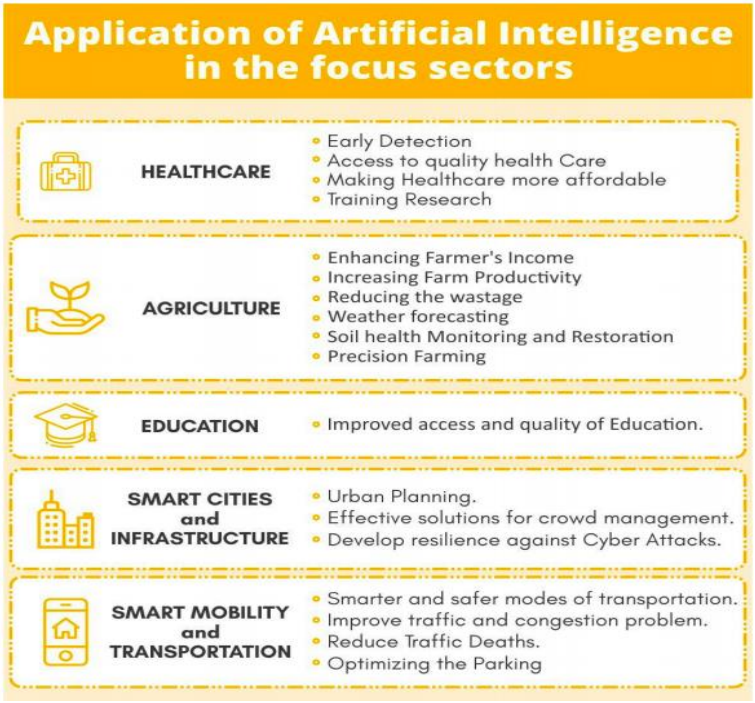
- **Supportive Mode -** AI performs alongside humans by facilitating human judgements by providing resources such as predictive outputs.
- **Reimagining the Business -** AI performs activities that **go beyond the cognitive abilities of humans** like addressing some previously intractable problem. For e.g. large-scale genome study in bioinformatics.
- **AI replaces the Humans -** This is especially useful in potentially harmful situations for humans such as environments and rapid system response in nuclear reactors.

Enablers for AI promotion

- Availability of large data sets and an **ecosystem (digital data marketplaces, exchanges, infrastructure)** which encourages free flow of data & information.
    - **Economic Survey 2018-19** also talks about collaboration between various departments to create such an ecosystem.
- **Enabling policy & regulatory framework**. E.g. stronger IP regime.
- Establishment of standards for **data safety**.
- **Skill sets** available with workforce.
- **Synergy between government, civil society, industry, academia** for encouraging R&D.
- **Data literacy** to create awareness about value of their own data
- Positive social attitudes towards machines and trust in autonomous systems.

Important role and benefits of AI

- **Boost growth:** According to some estimates cited by NITI Aayog, AI has potential to add around $1 trillion to India's economy and boost India's annual growth rate by 1.3% by 2035. AI has the **potential to overcome the physical limitations** of capital and labour and **drive growth** by enabling:
  - **Intelligent automation** i.e. ability to automate complex physical world tasks. For e.g.: A recent study found that a Google neural network correctly identified cancerous skin lesions more often than expert dermatologists did.
  - **Innovation diffusion** i.e. propelling innovations through the economy.
- **Manufacturing:** AI can help predict more reliable demand forecasting, a flexible responsive supply chain, quality assurance, accurate scheduling etc.
  - It can complement human capabilities and improve capital efficiency by enabling humans to focus on parts of their role that add the most value.
- **Financial Services** – It can ensure early detection of financial risk and systemic failures, and automation to reduce malicious intent in financial systems, such as market manipulation, anomalous trading etc.
- **Energy:** It includes energy system modelling and forecasting to decrease unpredictability and increase efficiency in power balancing and usage.
- **Logistics** – Products can be transported more efficiently with adaptive scheduling of deliveries and routing of vehicles.
- **Science and Technology** – It can help scientists and researchers to test hypotheses using robotic systems.
- **Role in social development and inclusive growth**: NITI Aayog has identified five focus sectors that are envisioned to benefit the most from AI in solving societal needs (see picture).
  - It is estimated that AI and connected farm services can impact 70 million Indian farmers by 2020, thereby adding US$ 9 billion to farmer incomes.



- **Defence and Security**: AI can be used for intelligence gathering, cyber defence, risk terrain analysis, detecting anomalous behaviour in humans, etc.
- **Governance and Policy Implementation**:
  - Deep learning can be used to effectively achieve various schemes' targets. For example: under the Swachh Bharat Abhiyan, officers are bound to upload pictures of toilets built. So, here AI can be implemented to flag out the one that haven't been properly built and also the location they are from.
  - It can also be used to enhance citizen-government interface, categorisation and arrangement of documents etc.
  - It can be used to **link various information to reach at a decision**. For e.g. It can help pick soil reports from various government agencies and link them to the environmental conditions using the data from a remote sensing satellite to predict the optimal crop for an area, appropriate inputs such as fertilisers and chemicals and provide real-time advisory to farmers.
- **Law Enforcement**: AI technologies can be used by law enforcement which include facial recognition, speech recognition, predictive analytics etc.
- **Disaster Management and Recovery** – It shows remarkable potential in providing remedial measures and control in aftermath of man-made and environmental disasters.
  - For e.g. unmanned drones and satellite feeds combined with image processing and recognition can be used in infrastructure damage assessments.
  - Distribution of food packages and medicines and other relief material.

Current Status of AI in India

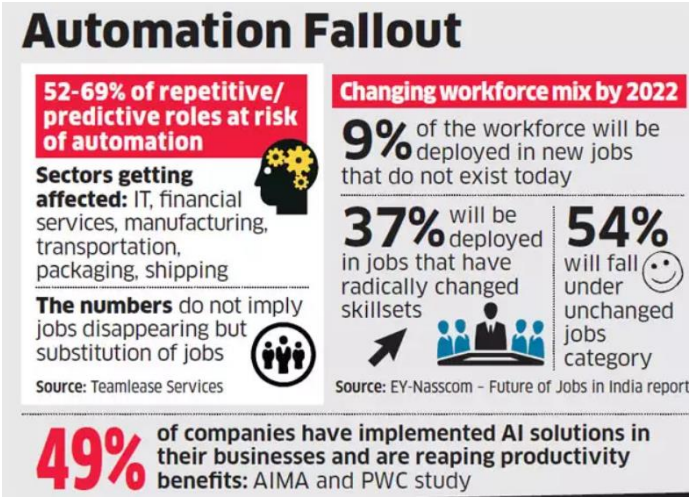
- **Delayed start:** Adoption of AI in India has been slow and remains limited. At present, India's capabilities in AI research are rather limited, both in quantity (distant fifth globally) and especially in quality (disappointing impact of research produced).
- **Participation of private sector:** Despite the country's prominence in the global IT industry, it has been slow to adapt to new digital technologies compared to its counterparts in China and the US.
  - Estimates indicate that only 22% of the firms in India use AI in any business process. While AI is deep algorithm, most start-ups are focused on digitisation and data analytics only.
  - Around $150 million have been invested in more than 400 companies over the past five years whereas US invested around $9.7 billion in AI in 2018.
- **Major applications of AI in India**: Currently it is majorly being used for:
  - Automation of business processes like AI Trading technology in stock market
  - Developing better diagnostic services like increasing usage of mHealth apps such as Mobiwebtech, Mobisoft Infotech, which are facilitating easy remote diagnosis.
  - Natural language processing and working of multiple languages
  - AI based facial recognition softwares like SAFR are being deployed
  - Increased use of big data to analyze student information & customize online content.
  - Off-the-shelf robotic applications are getting utilized to work in parallel to manual labours at construction sites
  - AI based Guest Management System in hospitality sector is being deployed to provide personalized experience to customers regarding their tastes or consumption by accessing real-time information.
- **Moving forward:** Although India is moving ahead towards **digitization** with the **Digital India initiative**, it is still far away from AI revolution. It lacks the ecosystem fostering innovation for AI. There is **no particular policy for the implementation, research and development of AI in India**.

What India can learn from other countries?

- US, the global leader in AI is heavily investing on AI based research and US leadership has largely been driven by the private sector.
- China has ambition of becoming world leader in AI by 2030. The top 9 universities of China have received large government funding to establish AI schools.
- EU's Robotics Public Private Partnership, launched in 2013, is believed to be the biggest civilian research programme in AI in the world.

Key challenges to adoption of AI in India

- **Inadequate availability of AI expertise, manpower and skilling opportunities**. For instance, only around 4% of Indian AI professionals are trained in emerging technologies such as deep learning.
- **Unattractive Intellectual Property regime** to incentivise research and adoption of AI
- **Data related issues**: Lack of standards, perceived poor transparency around data use and ownership, and the difficulty of gathering and sharing data has led to a situation where AI algorithm developers are still starved for data.
- **Lack of Funding and High resource cost**: Obtaining funding for developing AI driven solutions is a challenge that any emerging economy faces in the present day.
- **Job vs Automation debate:** It is being argued that if given the window to expand, AI will completely replace the need for manual labour. On the other hand, those in favour of AI believe that it will augment human potential to get better results.
  - According to a 2017 study by the McKinsey Global Institute, about 800 million people around the world will lose their jobs to automation by 2030.
  - Various studies on the effect of AI in India have been shown in the infographic.
- **Lack of enabling infrastructure**: For ex: cloud computing data which is an essential prerequisite for various AI functions is largely located on servers abroad.



- **Privacy and Security**: AI could also have grave impacts on the freedom of expression as it is applicable in a vast number of situations that impact how individuals access information online. Data loss and data security framework need to be robust which is lacking as of now.
- **Lack of awareness**: There still exists a lack of familiarity with high tech machine learning solutions across most parts of the world.
- **Ethical Issues involved in AI**
  - **Biasedness**: in the process of self-learning, stereotypes present in the society can be absorbed or transferred to them by developers and make decisions based on them.
  - **Accountability**: Difficult to hold someone accountable in case of failure of solutions provided by AI.
  - **Safety Issues**: AI machines might not work in a situation which has never been envisioned. This can create safety issues for others.
  - **Manoeuvrability**: The AI algorithms can be manipulated by ill-intentioned people who want to take advantage.
  - **Transparency:** Transparency in algorithms of AI is needed especially when it is involved in cognitive works with social dimensions, such as decision of an AI enabled car during an accident.
  - **Super-intelligence:** A sufficiently intelligent AI system can redesign itself or can create a better successor system which creates fear and debate around whether super-intelligence will be good or evil to humans.

Steps taken for AI

- **Budget 2019-20:** proposed setting up of National Research Foundation with an aim to catalyse and energise research and innovation across all academic disciplines including AI. Development of a National AI Centre and National AI Portal was also announced.
- **Centre of Excellence in Artificial Intelligence** (CoE in AI) has been setup by National Informatics Centre (NIC) which is a platform for innovative new solutions in AI space, a gateway to test and develop solutions for projects undertaken by NIC at central and state level.
- An Inter-Ministerial **National Artificial Intelligence Mission (N-AIM)** has been proposed to be established with an allocation of Rs 1,200 crore for a period of five years. Key features of N-AIM include:
  - Fund establishment of a network of alliances among Academia Services Industry, Product Industry, Start-ups and Government Ministries;
  - Establishing & administering National AI Challenge funds;
  - Increasing awareness of AI through AI-yatras;
  - Coordination of projects of national importance: to accelerate development and commercialisation of AI based products and technology through PPP models and start-ups
  - Establishing Centres of Excellence for promoting interdisciplinary research
  - Setting up of a generic AI test bed for verification & validation of AI based products
  - Funding an inter-disciplinary & dedicated large data integration center.
- Government has begun the use of Artificial Intelligence on pilot basis for crop cutting and yield estimation under scheme **Pradhan Mantri Fasal Bima Yoajana.**
- For improving production and productivity, **government has inked a pact with IBM** where, IBM will utilise Artificial Intelligence (AI) and weather technology solutions in agriculture to provide weather forecast and soil moisture information.
- Moreover, Microsoft India is using AI sensors to make farming and healthcare smart.
- In a **joint initiative with industry**, the government has set up **4 centres for promoting Industry 4.0**, across the country. Their task is to enhance competitiveness in every industry cluster across the country.

Way forward for AI adoption in India

- A **Task force on Artificial Intelligence (AI)** was constituted under the Department of Industrial Policy and Promotion in August 2017 that had following recommendations:
  - It identifies **10 specific domains** for rapid AI incorporation such as: manufacturing, fintech, healthcare, agriculture/food processing, education, retail/customer engagement, aid for differently abled/accessibility technology, environment, public utility services and national security.
  - Establishment of the **National Artificial Intelligence Mission (N-AIM)-** a centralised nodal agency for coordinating and facilitating research, collaboration and providing economic impetuous to AI start-ups.
  - It proposed **public private partnership model** for research and start-ups in AI.

- An inter-disciplinary large **data integration centre** in pilot mode to develop an **autonomous AI Machine** that can work on multiple data streams in real time and provide relevant information and predictions to public across all domains.
- Fund a **national level survey on identification of cluster of clean annotated data** necessary for building effective AI systems.
- **Establishing operation standards** for data storage and privacy, communication standards for autonomous systems, and standards to allow for interoperability between AI based systems.

- NITI Aayog published a discussion paper that outlines India's **National AI Strategy** as a roadmap to adopt AI.
  - NITI Aayog has identified **five priority sectors** where AI investments should be focused: health, education, agriculture, smart cities, and smart mobility.
  - It proposed a 2-Tier Research Architecture to address India's AI Aspirations:
    - ✓ **Centre of Research Excellence (CORE)-** It is focused on developing better understanding of existing core research and pushing technology frontiers through creation of new knowledge.
    - ✓ **International Centre of Transformational AI (ICTAI)-** It is entrusted with a mandate of developing and deploying application-based research. Private sector collaboration is envisioned to be a key aspect of ICTAIs.
  - It also recommends to set up a common cloud platform for Big Data Analytics and Assimilation.
- **Addressing ethical concerns:**
  - Resolutions can be brought to regulate Robotics, creating an ethics advisory committee and code of ethical conducts can be brought for Robotic engineers, as well as Research ethics committees.
  - AI systems can be made legally liable for their actions through making their programmers and users accountable.
  - Following ethical principles should be followed:
    - ✓ Beneficence: robots should act in the best interests of humans
    - ✓ Non-maleficence: robots should not harm humans
    - ✓ Autonomy: human interaction with robots should be voluntary
    - ✓ Justice: the benefits of robotics should be distributed fairly
    - ✓ Transparency: developing algorithms that can be tested and verified
- **Other steps that can be taken:**
  - **Strong data infrastructure**: The data infrastructure will need to become more robust before large scale AI deployment can be successful.
  - **Improve capacity and enhanced understanding of emerging technologies**: Across sectors, there is a need to grow capacity within the government for effective implementation of AI driven solutions.
  - **Open source platform**: An open source platform would make the solutions more affordable, resulting in rapid adoption and higher penetration among the beneficiaries.
  - **Incentives to farmers**: Government needs to step in by giving incentives to farm to adopt AI and making it more affordable and attractive for farmers.
  - **Ensure adequate government funding and investment in R&D**: There is a need for significant financial commitment from governments towards research and development surrounding AI. Initiatives such as Centres of Excellence (CoE) in AI should be increased to improve more research in the field of AI.
    - ✓ **Allocation of Resources in STEM** (Science, Technology, Engineering and Mathematics) need to be increased.
  - **Collaboration between stakeholders**: Industry, Government and all other stakeholders need to come together for viable solutions to various socio-economic problems.

Summary

Artificial intelligence refers to the ability of machines to perform cognitive tasks like thinking, perceiving, learning, problem solving and decision making. It enables computer system to carry out task on their own that otherwise requires human intelligence.

- **Machine Learning** is a subset of Artificial Intelligence and is based on algorithms that gives the ability to computers to learn from data, identify patterns and make decisions or predictions with minimal human intervention.
- **Deep Learning** is the subset and next evolution of machine learning concerned with algorithms inspired by the structure and function of the brain called artificial neural networks. Like a human brain, computer can identify various features in data automatically.

Important role and benefits of AI

- Boost India's annual growth rate by 1.3% by 2035.
- Can help in labour and capital augmentation and offer more reliable demand forecasting, predictive maintenance, quality assurance etc.
- Early detection of financial risks, reducing malicious intent in financial systems etc.
- Automation of business processes like AI Trading technology in stock market.
- Products can be transported more efficiently with adaptive scheduling of deliveries.
- Can help scientists and researchers to test hypotheses using robotic systems.
- Can be used for intelligence gathering, surveillance, cyber defence etc.
- Improved governance and Policy Implementation through better citizen-government interface, categorisation and arrangement of documents etc.
- Law Enforcement through facial recognition (SAFR application), speech recognition, predictive analytics etc.
- Infrastructure damage assessments by using drones, distribution of food packages etc.
- Developing better diagnostic services like increasing usage of mHealth apps such as Mobiwebtech, Mobisoft Infotech, which are facilitating easy remote diagnosis.
- Increased use of big data to analyze student information & customize online content.

Key challenges to adoption of AI in India

- **Inadequate availability of AI expertise, manpower and skilling opportunities**.
- **Unattractive Intellectual Property regime**
- **Data related issues** such as lack of standards, poor transparency around data use etc.
- **Lack of Funding and High resource cost**
- Fear of job losses because of AI
- **Lack of enabling infrastructure** such as cloud computing data.
- **Lack of awareness**
- **Ethical Issues involved:** such as lack of strict accountability, transparency of algorithms etc.

Steps taken so far

- **Budget 2019-20:** proposed setting up of **National Research Foundation, National AI Centre and National AI Portal.**
- **Centre of Excellence in Artificial Intelligence** (CoE in AI) has been setup by National Informatics Centre (NIC)
- An Inter-Ministerial **National Artificial Intelligence Mission (N-AIM)** has been proposed to be established
- Government has begun the use of Artificial Intelligence on pilot basis for crop cutting and yield estimation under scheme **Pradhan Mantri Fasal Bima Yoajana.**
- **Following a pact with the government**, IBM will utilise Artificial Intelligence (AI) and weather technology solutions in agriculture to provide weather forecast and soil moisture information.
- In a **joint initiative with industry**, the government has set up **4 centres for promoting Industry 4.0**, across the country.

Way Forward

- Major recommendations of **Task force on Artificial Intelligence (AI):**
  - Establishment of the **National Artificial Intelligence Mission (N-AIM)**
  - **Public private partnership model** for research and start-ups in AI.
  - An inter-disciplinary large **data integration centre** in pilot mode to develop an **autonomous AI Machine**
  - Fund a **national level survey on identification of cluster of clean annotated data**.
  - **Establishing operation standards** for data storage and privacy, communication standards for autonomous systems, and standards to allow for interoperability between AI based systems.

- **Recommendations by Niti Aayog:**
  - A 2-Tier Research Architecture involving **Centre of Research Excellence (CORE) and International Centre of Transformational AI (ICTAI).**
  - It recommends to set up a common cloud platform for Big Data Analytics and Assimilation.
- **Addressing ethical concerns by** improving transparency, by introducing Code of ethics etc.
- **Ensure adequate government funding** and investment in R&D. Allocation of Resources in STEM (Science, Technology, Engineering and Mathematics) need to be increased.
- **Open source platform**: An open source platform would make the solutions more affordable
- **Incentives to farmers**: Government needs to step in by giving incentives to farm to adopt AI
- **Collaboration between all stakeholders** like Industry and Government is needed