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# **Artificial Intelligence - Challenges and Opportunities for India**

Artificial Intelligence can be described as a system's ability to learn and interpret external data via software/algorithms or machines/devices for problem solving by performing specific roles and tasks currently executed by humans. The term AI has been used interchangeably with other closely related terms such as expert systems, decision-support system, knowledge-based systems, machine learning, natural language processing, neural networks, pattern recognition, recommender systems and text mining.

## **Background -**

Although the origin of the term AI can be traced back to early 1950s, the relatively recent advancement in information technology (such as big data, improved computing, storage capability and superfast speed of data processing machines) and robotics has enabled AI to gain significant momentum in terms of its development, application and use within public and private organisations.

## **Opportunities and Application -**

The ability of AI to overcome some of the computationally intensive, intellectual and perhaps creative limitations of humans opens up new application domains within manufacturing, law, medicine, healthcare, education, government, agriculture, marketing, sales, finance, operations and supply chain management, public service delivery and cyber security.

## **AI in Education -**

Within the education sector, AI can be deployed to improve teacher effectiveness and student engagement by offering capabilities such as intelligent game-based learning environments, tutoring systems and intelligent narrative technologies.

- Firstly, AI-enabled hyper-personalisation helps in developing student-specific learning profiles and in developing customised learning environments based on ability, preferred mode of learning and experience.
- Secondly, the use of smart assistants (Amazon Alexa, Google Home, Apple Siri, and Microsoft Cortana) and associated technologies offer significant potential to help students. Universities are already using voice assistants to help answer common questions about campus, student schedules and courses.
- Thirdly, AI systems can assist educators with secondary tasks such as grading activities, providing personalised responses to students, handling routine and repetitive paperwork and dealing with logistics-related matters.

## **Application of AI in India -**

- Within the Indian context, a number of key indicators from health, education and agriculture sectors are important to highlight as AI is further adopted.
- AI could be a valuable assistive tool for doctors in helping reduce their workload and assisting in diagnosis. AI-assisted diagnostics can provide access to quality healthcare for people in remote areas.
- The Tamil-Nadu e-Governance Agency has partnered with Anna University to launch a Tamil smart assistant called “Anil”. This NLP-based smart assistant provides a step-by-step guide to people in helping them apply online for scores of critical government services.
- The agency has recently launched an AI-based agricultural pest and disease identification system and made it available to over half a million farmer families through a mobile app.
- The Tamil Nadu Government is implementing an innovative use of AI through face recognition for recording attendance.
- Within healthcare, AI solutions such as radiographic diagnostics like “detection of internal bleeding in the brain from CT scans” are being tried to assist doctors and increase their reach to serve remote areas of India.

#### **Challenges and Shortcomings -**

1. **Lack of explainability** - Generally AI operates effectively as a black-box-based system that does not transparently provides the reasoning behind a particular decision, classification or forecast made by the systems.
2. **Lack of contextual awareness and inability to learn** - Unlike human, AI-based systems cannot learn from their environment. This limits the application of AI to specific types of domains.
3. **Lack of standardisation** - AI-based systems that may have utilised different types of technologies/techniques are increasingly being embedded in a variety of products and services. The organisations face challenges on how to ensure AI and human work together successfully.
4. **Job losses** - Increasing automation will lead to significant job losses particularly at operational and lower skill levels for repetitive tasks.
5. **Lack of competency and need for re-skilling and up-skilling workers** - A large number of organisations still lack in-house competency to successfully develop and implement AI-based systems. Using or working with AI-based systems require workers to be equipped with a new and advanced set of skills, which is a challenge for government, organisations and individuals.
6. **Lack of trust and resistance to change** - A major challenge is how to establish trust among workers and stakeholders in the management of resistance to change in adoption AI systems.

#### **Ethics -**

1. **Privacy and Data Protection** - Users’ sensitive and highly granular data is likely to be stored and shared across the AI network.

2. **Human and Environment Values** - Any AI systems has to conform to human value systems. An important aspect which needs to be built into AI systems is the overall cost of their decisions on the society.

#### **Transparency and Audit -**

There exists a legal need to explain the decision taken by such systems in case of litigation. These AI systems must provide an audit trail of decisions made not only to meet the legal needs but also for us to learn and make improvements over past decisions.

#### **Digital Divide and Data Deficit -**

Countries where the data is of poor quality and of poor granularity would be left behind in harnessing the power of AI to improve lives of its citizens adversely affecting low-resource communities.

#### **Fairness and Equity -**

They must not exhibit any gender or racial bias and they must be designed to stay away from 'social profiling' (especially in law enforcement, fraud detection and crime prevention areas). The recent reports questioning the neutrality of AI systems used by police to identify crime-prone individuals has brought this issue out in sharp focus.

#### **Accountability and Legal Issues -**

Once machines are equipped with AI and take autonomous decisions, the question of accountability becomes very hard to answer, more so when the algorithms are unknown to the designer.

#### **Misuse Protection -**

Autonomous AI systems must be designed for misuse protection. It cannot be an afterthought.

#### **Conclusion -**

Public roll-out of AI systems needs to address issues of ethics, transparency, audit, fairness, equity, accountability and misuse prevention. An effective public policy framework for AI along with a practical scorecard would be needed to make this AI revolution work towards an equitable prosperity.

## **Quality Education for Weaker Section and Disadvantaged Groups**

Section 8(c) of the RTE Act, 2009 provides that the appropriate government would ensure that the child belonging to weaker section and belonging to disadvantaged group are not discriminated against and prevented from pursuing and completing elementary education on

any grounds. Further, Section 12(1)(c) of RTE Act, 2009 provides that all specified category schools and unaided schools shall admit at least 25% children belonging to weaker section and disadvantaged group in the neighbourhood in class I and provide free and compulsory elementary education till its completion.

#### **Steps taken to ensure education of children with disability -**

- **Samagra Shiksha** - It is an overarching programme for the school education sector extending from pre-school to class XII, aims to ensure inclusive and equitable quality education at all levels of school education. It envisages the 'school' as a continuum from pre-school, primary, upper primary secondary to senior secondary school. Entitlements include free uniforms, textbooks, special training of out-of-school children etc., provision for inclusive education of Children with Special Needs (CWSN) and vocational education among others.
- **Padhe Bharat Badhe Bharat** - It is a sub-programme of erstwhile Sarva Shiksha Abhiyan which is continued under the new integrated scheme Samagra Shiksha to ensure quality at the foundational years of schooling. The objectives of the programme are to promote early reading and writing with comprehension skills in children, and also basic numeracy skills.
- **The Navodaya Vidyalaya Scheme** - It provides for opening of one JNV in each district of the country to bring out the best of rural talent. Its significance lies in the selection of talented rural children as the target group and the aim to provide them quality education comparable to the best in a residential school system.

## **Key Initiatives in Education**

The Government has launched several new schemes in the Higher Education Department to boost research and innovation culture in the country. Department of Higher Education of the Ministry has released a five-year vision plan named **Education Quality Upgradation and Inclusion Programme (EQUIP)**. SWAYAM 2.0, Deeksharambh and PARAMARSH are some of the other major schemes of the Department of Higher Education.

#### **Key Reforms in School Education -**

1. **NISHTHA** - A National Mission to improve learning outcomes at the elementary level through an Integrated Teacher Training - Programme called NISHTHA - National Initiative for School Heads' and Teachers' Holistic Advancement was launched. This integrated programme aims to build the capacities of around 42 lakh teachers and heads of schools, faculty members of SCERTs and DIETs, Block Resource Coordinators and Cluster Resource Coordinators.
2. **DHRUV** - The Pradhan Mantri Innovative Learning Programme (DHRUV) was launched to identify and encourage talented children to enrich their skills and knowledge. The

Programme 'DHRUV' will act as a platform to explore the talent of outshining and meritorious students, and help them achieve excellence in their specific areas of interest may it be science, performing arts, creative writing, etc.

3. **SHAGUN** - One of the world's largest Online Junction for - School Education 'SHAGUN' is an overarching initiative to improve school education system by creating a junction for all online portals and websites relating to various activities of the Department of School Education and Literacy in the Government of India and all States and Union Territories.
4. **Unified District Information System for Education Plus (UDISE+)** - To ensure quality, credibility and timely availability of information from all the schools in the country, the revamped UDISE+ has been launched. The GIS based mapping portal gives information about the location of more than 15 lakh schools in the country along with some salient highlights.
5. **Digital Infrastructure for Knowledge Sharing (DIKSHA) 2.0** - DIKSHA Portal was launched in 2017 for providing digital platforms to teachers giving them an opportunity to learn and train themselves and connect with teacher connectivity.
6. **Operation Digital Board (ODB)** - The aim is to provide by March 2023, two smart classrooms for every Secondary/Senior Secondary school.

#### **Key reforms in Higher Education -**

1. **Five-year vision plan 'Education Quality Upgradation and Inclusion Programme' (EQUIP)** - The Department of Higher Education of MHRD has released a five-year vision plan named 'Education Quality Upgradation and Inclusion Programme' (EQUIP). This report sets out to deliver further on principles of access, inclusion, quality, excellence and enhancing employability in Higher Education.
2. **Institution of Eminence (IoE)** - Ten institutions in public sector and 10 institutions in private sector have to be declared as IoE. Each public institute (IoE) will be eligible to receive Rs 1,000 crores during the next 5 years.
3. **SWAYAM 2.0** - SWAYAM 2.0 is initiated with enhanced features and facilities to offer online degree programmes through SWAYAM by top ranking universities.
4. **SWAYAM PRABHA - DTH Educational Channels** - It is a project to telecast high-quality educational programs through 32 DTH channels on 24X7 basis to reach out to student/learners of India with wide reach and minimal cost.
5. **Scheme for Trans-disciplinary Research for India's Developing Economy (STRIDE)** - Launched for promoting quality research by faculty and creation of new knowledge.
6. **PARAMARSH** - A scheme to mentor institutions seeking National Assessment and Accreditation Council accreditation.

# **Open and Distance Learning : A Futuristic Approach**

## **What is Open and Distance Learning?**

ODL is defined by the Commonwealth of Learning (COL) as “a way of providing learning opportunities that is characterised by the separation of teacher and learner in time, or place or both time and place; learning that is certified in some way by an institution or agency; the use of variety of media including print and electronic; two-way communications that allow learners and tutors to interact; the possibility of occasional face-to-face meetings; and a specialised division of labour in the production and delivery of courses.”

## **How is it done?**

- In Distance Education teaching is done with a variety of “mediating processes” used to transmit content, to provide tuition and to conduct assessment or measure outcomes.
- In the virtual classroom the learners and the teachers meet in cyberspace, a question-and-answer session follows. The learners are required to go through the self instructional materials (SIMs) before the class. This method not only helps the students to learn more but it also facilitates more interaction between the learner and the teacher. These include wireless communications, the information highway, asynchronous mode, integrated services digital networks (ISDNs), multimedia applications, personal digital assistants, artificial intelligence and virtual reality.

## **Significance of IT in ODL -**

- The web-based study helps the learners and teachers to access the information at their own choice of time and convenience.
- IT can promote the opportunities of restructuring the teaching-learning process and transform it by offering alternatives to the teacher in providing information, access to virtually unlimited resources, and opportunities for real-world communication, collaboration and competition.
- Web can enrich the learning resources and help institutions refocus from teaching to learning, from teacher to learner. It can create a learning environment throughout the world by networked learning communities.
- Information and Communication Technology also facilitates access to experts, resource persons, researchers, professionals, mentors, business leaders, and peers - all over the world.
- In the age of information technology, effective and efficient learning is potentially possible at all levels for all round the clock.

## **Conclusion -**

Effective combination of media and technology is necessary for assuring effectiveness of the open and distance learning system.

## **Cybersecurity : Issues and Challenges**

Of the 7.6 billion humans on Earth, around 3.6 billion are online. In this era, we need skills for surviving in a digital environment. For security and safe use of digital resources, digital literacy has become a must.

### **Issues -**

- There are many problems like bullying, cyber crime, copyright issues, security threat and social unawareness among others. To avoid and prevent threats in the digital world, digital literacy is essential, which helps in creating awareness in digital space.
- In the year 2016, there were a total of 758 million online attacks worldwide, which amounts to around 2 million in a single day.
- Developed primarily for companies to engage with their users automatically for increasing customer engagement, bots are now being used much beyond their harmless cause and are misused for manipulating a conversation to creating a mirage of someone's personality and much more.
- In this age of misinformation, bots possess the power to hijack a conversation, troll someone, promote propaganda and even cause security issues.

### **Cybersecurity challenges -**

- Some new threats have also come up like organised cyber crime, cyber crime trading, smishing (phishing with SMS), hacktivism (hacker with activism) etc.
- Another type of attack that is rising recently is distributed denial of service (DDoS) attacks. Here, the intruder is not interested in actually stealing your information but in bombarding your server with unnecessary traffic thereby crashing it. Huge servers like video streaming apps and the majority of banks are under this type of attack.

### **Ransomware -**

- This ransom demanding malware is a virus which gets into your computer, either when you download an attachment containing the virus or when you visit any such website and click on a link.
- Once it gets into your computer, it starts to encrypt all your files thereby rendering them useless. The only way to unlock your files is to get a secret key from the hacker by paying a ransom. And this ransom is usually demanded through bitcoin which keeps the payee anonymous. There has been a 600% increase in ransomware variants since 2016.

### **Protection against Cyber Attacks -**

For securing information on the social networking sites, following guidelines can be followed -

1. Limit the amount of information that you disclose on social networking sites;
2. Do not establish friendship with strangers;
3. Customise your system settings according to your needs by changing the default settings;
4. Beware of third-party applications. Avoid applications that seem suspicious;
5. Secure your system, because unsecured network can lead to loss of your personal data;
6. Use antivirus software to secure your computers and electronic devices;
7. Use strong passwords to protect your account and personal information;
8. Do not set the password for all social accounts, because if one site's password is compromised, all other accounts will be exposed to threats;
9. Choose a suitable authentication scheme so that no one can access the details. Two-factor and multi-factor authentication should be in place.

## **Global Synergy in Higher Education**

India's draft National Education Policy aims at increasing the gross enrolment ratio (GER) in higher education to at least 50 percent by 2035, which would mean that one in four graduates in the world would be a product of the Indian higher education system. The current GER stands at just 26.3 percent, and doubling it in the next 15 years will require significant reforms both at planning and execution level. India's GER is lower than the global average of 36.7%.

### **Statistics and facts -**

- Private colleges cater to 66.4 percent of the total enrolment in higher education, which means that a mere 22 percent of government colleges are catering to a disproportionately large number of students who could not afford to seek higher education in private Higher Education Institutions (HEIs).
- Increasing social aspirations have made the education divide between urban and rural centres more obvious. Five Indian states - Uttar Pradesh, Maharashtra, Tamil Nadu, West Bengal and Karnataka - account for more than 54 percent of the total student enrolment in higher education.
- Low employability of graduates, poor quality of teaching, weak governance, insufficient funding, and complex regulatory norms continue to affect the Indian higher education sector.

### **What India is doing?**

- India's recently released Draft National Education Policy 2019 proposes inviting the top 200 global universities to establish foreign branch campuses in India. The Ministry of Human Resource Development (MHRD) has developed a five-year action plan named EQUIP (Education Quality Upgradation and Inclusion Programme). The initiative is made to bring transformation in the higher education system in the upcoming 5 years.

- NITI Aayog has more recently favoured the development of Exclusive Education Zones (EEZs) akin to SEZs in a few select cities in Bengaluru, Hyderabad, Ahmedabad, Pune, Chandigarh and parts of Sikkim, to boost growth in the inflow of foreign students.
- India is also seeking to attract international faculty into the country for short-term research and teaching visits. Indian Government's initiatives like the Global Initiative of Academic Networks (GIAN), which provides funding for teaching at selected Indian higher education institutions and Scheme for Promotion of Academic and Research Collaboration (SPARC) are opportunities that can be explored.

**Way forward -**

- English language teaching and training, use of technology for experiential learning and equipping and training teachers/faculty can be explored for building capacities.
- Research partnerships with other nations can also be developed that could deliver solutions to clearly specified problems in water, infrastructure, poverty alleviation, security, health and governance.