**26.2 Artificial Intelligence** **(AI)**

**Intelligence** refers to certain mental powers. There is no general agreement on which mental powers are intelligent or part of intelligence.

* A part of intelligence allows people to solve problems.
* These problems may or may not be easy to solve.
* These may involve abstract thoughts.
* For some, intelligence is a property or characteristics of mind.
* For others it is simply the working of brain, especially the cerebral cortex.
* There is no agreement about which has more influence on intelligence, genetics or environment.
* Scientists believe that intelligence can be measured or tested.
* A type of intelligence test would be solving many problems in a very short time.
* Most of the problems have to do with seeing things, or telling what a rotated shape would look like.
* Some are also related with mathematics; for example what number would come next in the arrow.
* Other tests have to do with words or the understanding of language.
* After giving such a test to a person, a number would be calculated to give an approximation of the Intelligence Quotient (IQ).
* Intelligence Quotient is the mental age of a person divided by his physical age.

**What is artificial intelligence (AI)?**

* It is sometimes called **Machine Intelligence.**
* It is the ability of the machine to imitate intelligent human/animal behavior, think, learn and perform tasks normally, such as visual perception, speech recognition and decision making skills. Such capabilities include; Computers playing chess. Car operation, speech recognition as in smart phones, military simulations, decision making skills etc.

**Summarization of Artificial Intelligence:**

An Intelligent entity created by humans, capable of performing tasks intelligently without being explicitly instructed, capable of thinking and acting rationally and humanely.

**History**

* The beginning of modern AI has been traced back to the time where classical philosophers attempted to describe human thinking as a symbolic system.
* Between 1940s and 50s, a handful of scientists from various fields discussed the possibility of creating an artificial brain.
* This lead to the rise of the field of AI research which was founded as an academic discipline in 1956—at a conference at Dartmouth, New Hampshire.
* The word **Artificial intelligence** was coined by John McCarthy**,** who is **n**ow considered as father of Artificial Intelligence.

***Its research can be divided into three different systems;***

1. **Analytical:** it has the only characteristics consistent with cognitive intelligence generating cognitive representation of the world and using learning based on the past experience to inform future decisions.
2. **Human-inspired:** it has elements from cognitive as well as emotional intelligence, understanding in addition to cognitive elements, but also human emotions considering them in their decision making.
3. **Humanized artificial Intelligence:** it shows the characteristics of all types of competence (that is cognitive, emotional and social intelligence), able to be self-conscious and self-aware in interactions with others.

**Artificial Intelligence Winters**

* Despite the well-funded global efforts over several decades, scientist found it extremely difficult to create intelligence in machines.
* Between 1970s and 1990s, scientist had to deal with an acute shortage of funding for AI research.
* These years are known as **AI winters.**

**Renewed thrust**

* However by the late 1990, American corporations once again were interested in AI. Furthermore the Japanese govt. too came up with plans to develop fifth generation computer for the advancement of AI.
* Finally in 1997 IBM’s Deep Blue became the first computer to beat the world chess champion Garry Kasparov, largely due to improvements in computer hardware AI and related technology and its continuous march.
* Corporations and governments too began the successful use of its methods in other domains.
* During the last 15 years many companies world over have managed to leveraged AI technology to a huge commercial advantage.
* The technology has managed to pay a role in every sector.
* AI technology is also used successfully in the stock market too.
* The inclusion of AI as an elective subject necessitated the need to ponder over the subject early and seriously. It has been decided that the subject will be introduced from class 9th onwards as a skill subject.
* Objective behind this exercise is to build strong background of AI in students and develop a mindset to think like a researcher.
* AI involves many different fields like computer science, mathematics, linguistics, psychology, neuroscience and philosophy.
* Researchers hope to create a “general artificial intelligence” which can solve many problems instead of focusing on just one.
* Researchers are also trying to create, creative and emotional AI which can possibly emphasize or create art.

**Drawbacks of AI in education**

* It does not teach social skills and human connections, hence cannot replace human teachers.
* It always requires the expensive internet connectivity, unaffordable for poor students.
* Available software for AI is expensive.
* AI machines are susceptible of errors peculiar to computer system such as crashing, virus attack and upgrade issues.

**Conclusion**

* Of course AI is not a substitute to teachers; however plenty of its useful benefits are there in education technology.
* AI will surely make the teacher’s job easy and more efficient. It will be helpful for teachers and parents alike.

**Some of the most important disciplines of AI are**

* **Perception—**understanding images, audio etc.
* **Reasoning—**answering questions from data.
* **Planning—**inferring the required steps to reach a goal.
* **Motion—**moving a robot in an environment.

**Main branches of AI**

* **Natural language processing (NPL)**
* Understanding human language.
* These areas overlap the real world projects and sometimes use many branches at a time e.g. an online bot might use Natural Language Processing (NPL) and sentiment analysis to understand a quarry and reasoning to offer a satisfactory reply.
* **Bot** is software that can respond back to user’s input, relying upon the input key words. All such scenarios are possible when there is some AI in a software system that can prompt relevant business units when an event occurs. No human intervention is required.
* **Machine Learning—ML**
* It is a method of data analysis, automating analytical model building.
* It is a branch of AI based on the idea of systems learning from data, identifying patterns and making decisions with very little human interception.
* **Deep Learning—DL**
* Deep learning is part of a broader family of machine learning methods based on artificial neural networks with representation learning.
* This learning can be divided into three categories, **supervised, semi-supervised, and un-supervised.**
* **Robotics**
* It is the study of robot technology.
* It makes use of the disciplines like dynamic system modeling and analysis, mathematics, physics, biology, mechanical engineering, computer science and engineering and automation (sensor, control and actuators) technology.
* **Expert System**
* In AI, an expert system is a computer system which emulates the decision making ability of a human expert.
* Expert systems are designed to solve complex problems by reasoning through bodies of knowledge, rather than through conventional procedural code.
* **Fuzzy Logic**
* It is an approach to computing based on ‘degrees of truth rather than usual true or false.
* Boolean logic on which the modern computer is based.
* **There are two other branches of AI**

1. **Narrow AI**

* It is a branch of computer science to create intelligent machines and smart software, along with parallel processing, computer graphics, algorithms, complexity theory, networking and programming languages.
* It has become an essential part of IT industry.
* The core problems of nAI include *programming computers for knowledge representation and reasoning, problem solving, perception, learning, planning, action etc.*
* The core parts of nAI are *knowledge engineering, Machine Learning, Machine Perception, Robotics.*
* It is to become an essential part of any industry.

1. **Broad AI**

* The broad AI is a science and technology to create intelligent cyber-physical systems, as computing systems, smart machines, intelligent software and algorithms
* The core problems of bAI include programming computers for, *general intelligence, knowledge representation and reasoning, problem solving, perception, learning, planning, action etc.*
* The core parts of bAI are, *computer science and software engineering, ontological engineering, Machine Learning, Machine Perception, NPL, cybernetics, Automation and Robotics, internet of everything etc.*
* Integrating all the key AI tools and approaches, the bAI involves the relevant concepts, ideas, theories and methods from all the sciences and technologies.

**AI in our classrooms**

* There is an acute shortage of teachers at all levels, be it the primary, secondary, senior secondary, college or university levels in Indian academic institutions.
* It implies that the dearth has a potential for employment of the subject teachers.
* Bringing AI to the classrooms might just be the solution that we have been looking for.

**Why AI is way forward**

* Right from e-commerce to healthcare, to education, in each and every sector, intervention of AI has increased many folds.
* Many companies are now investing in developing their own version of AI and Machine learning.
* So, what exactly is AI and machine learning and why it is called the next big thing?
* Each and every decision that we make is data driven.
* The best example of the same is the online recommendations that we receive while surfing retail websites such as Amazon or Flipkart.
* It is the Machine learning technology that recommends the products based on our previous purchase.
* Now, imagine using similar technology to track the performance of an individual student based on his/her previous grades, participation, and performances.
* Won’t it help the student to enhance his/her performance?
* Therefore AI has been taken seriously to fix loopholes in the education sector across the globe.

**Streamlining the education system**

* The best examples of AI that we know are “Cortana” by windows, “Siri” by apple and “Alexa” by Amazon.
* These are voice recognition systems that can imitate human intelligence.
* These systems are not only helping us to gain knowledge but also enhance our decision making ability.
* This technology is also known as machine learning which has been used in certain areas to track vital issues pertaining to education.

**Assistance to teachers**

* Teachers have to handle multiple responsibilities such as evaluation, grading, paper setting, crating mark-sheets and tracking the performance of every student. If these tasks are made easy for them, then they would focus more on course development, teaching quality and skill development.
* AI system can assist teachers on all these tasks making these tasks not only automated but also intelligent. With AI system in place, it will be easier for teachers to focus students rather than mundane administrative task.

**Accessible and inclusive education**

* India has over 600 million young people who deserve a good education, skills and jobs.
* Various tutoring programs, learning applications with skill-based curriculum are being developed across the globe.
* These AI enabled systems will bring globe classroom at our finger tips.
* It will not only empower students but also teachers in upgrading themselves with current trends.
* Such systems could be a boon for rural education.
* Students living in most remote parts of India would be able to learn the way it is learned in an urban setting.

**Proctored online assessment**

* Remote proctoring is the new technology that can help to simplify the exam invigilation process.
* Students can appear in exams from any location classroom/home.
* System is able to invigilate such exam remotely using remote proctoring.
* It uses a web camera attached to the computer system to authorize remote students.
* Many education institutes, corporate, universities have started using this technology to simplify the examination process with the AI of Remote Proctoring.

**Answer sheet evaluation**

* Physical sheet examination is a tough and time consuming process in educational institutions.
* Many institutions are moving towards *onscreen evaluation system* as it is intelligent and auto-calculates the score.
* It also ensures that the examiner has truly verified all pages of the answer sheets.
* It can help to automate result processing.

**CBSE class 9th AI syllabus 2019-2020.**

* The CBSE is introducing AI as an optional 6th subject at class 9th from the session 2019-2020 onwards.
* To enhance multi disciplinary approach in teaching-learning and also to sensitize the new generation, it was decided that schools may start AI ‘inspire module’ of 12 hours at class 8th itself.
* As per norms, a skilled subject, at secondary level, may be offered as additional sixth subject along with the existing five compulsory subjects.
* CBSE has collaborated with several organizations such as intel, IBM, Microsoft.
* 1000 teachers nominated by CBSE underwent a 3-day project-based training for practical, hand on knowledge of Microsoft 365 tools such as OneNote, Flipgrid, Teams, Outlook and Microsoft and Paint3D Microsoft.
* If a student fails in any one of the three elective subjects (science, math and social science) then it will be replaced by the skill subject (offered as 6th subject) and the result of class 10th will be computed based on best five subjects.
* However, if a student desires to reappear in the failed subject, he/she may appear along with compartment examination.
* Similarly at senior secondary level, the board has advised to schools to offer at least one or more skill-based subject as elective subject out of the 42 subjects.
* The board will provide the necessary support and guidance towards training and capacity building of teachers and other aspects for the successful implementation of skill-subjects from time to time.

**Role of AI in education**

* ***Artificial Intelligence can automate basic activities in education***
* Like grading. It is now possible for teachers to automate grading for nearly all kinds of multiple choices and fill-in-the-blank testing and automated grading of students’ writing may not be far behind.
* ***Educational software can be adapted to student need.***
* From KG to graduation level one of the key ways AI will impact education is through the application of greater levels of individualized learning.
* Some of this is already happening through growing adaptive learning programs, games and software.
* These systems respond to the need of the student, putting greater emphasis on certain topics, repeating things that students have not mastered, and generally students to work at their own pace.
* ***Students could get additional support from AI tutors.***
* Some tutoring programs based on AI already exist and students can go through basic mathematics, and other subjects.
* These programs can teach students fundamentals, but so far are not ideal for helping students learn high-order thinking and creativity, something that real world teaches are still require to facilitate.
* With rapid pace of technological advancement, advance tutoring system may not be a pipe dream.
* ***AI-driven programs can give students and educators helpful feedback***
* AI can, not only help teachers and students to craft courses that are customized to their needs, but it can also provide feedback to both about the success of the course as a whole.
* ***It is altering how we find and interact with information***
* We rarely notice AI systems that affect the information we see and find on a daily basis.
* Google adapts results to users based on location, Amazon makes recommendations based on previous purchases, Siri adapts to our needs and commands, and nearly all web ads are geared towards our interests and shopping preferences.
* These kinds of intelligent systems play a big role in how we interact with information in our professional and personal lives, and could just change how we find and use information in schools and other academic institutions.
* ***It can point out places where courses need to improve.***
* Teachers may not always be aware of gaps in their lectures and educational materials that can leave students confused about certain concepts. AI offers a way to solve that problem.
* Courser, a massive open online course provider, is already putting this into practice.
* When a large number of students are found to submit the wrong answer to a homework assignment, the system alerts the teacher and gives future students a customized massage that offers hints to the correct answer.
* This type of system helps to fill in the gap in explanation that can occur in courses, and help to ensure that all students are building the same conceptual foundation.
* Rather than waiting to hear back from the teacher/professor, students get immediate feedback that helps them understand a concept and remember how to do it correctly next time around.
* ***It could change the role of the teachers.***
* There will always be a role for teachers in education, but what that role is and what it entails may change due to new technology in the form of intelligent computing systems.
* AI can take over tasks like grading, can help students improve learning, and may even be a substitute for real world tutoring.
* Yet AI could be adapted to many other aspects of teaching as well.
* AI systems could be programmed to provide expertise, serving as a place for students to ask questions and find information or could even potentially take the place of teachers for very basic course materials.
* However, AI will shift the role of the teacher to that of facilitator.
* Teacher will supplement AI lessons, assist students who are struggling, and provide human interaction and hands-on experiences for students.
* In many ways technology is already driving some of these changes in the classroom, especially in schools those are online or embrace the flipped classroom model.
* ***AI can make trial-and-error learning less intimidating.***
* Trial and error is a critical part of learning, but for many students, the idea of failing or even not knowing the answer is embracing.
* Some simply don’t like being put on the spot in front of their peers or authority figure like a teacher.
* An intelligent computer system, designed to help students to learn, is a much daunting way to deal with trial and error.
* AI could offer students a way to experiment and learn in a relatively judgment-free environment, especially when AI tutors can offer solutions for improvement.
* In fact AI is the perfect format for supporting this kind of learning, as AI systems themselves often learn by trial-and-error method.
* ***Data powered by AI can change how schools find, teach and support students.***
* Smart data gathering, powered by intelligent computer systems, is already making changes to how colleges interact with prospective and current students.
* From helping students choose the best courses, intelligent computer systems are helping make every part of the college experience more closely tailored to students and their goals.
* ***AI may change where students learn, who teaches them and how they acquire basic skills.***
* AI has the potential to radically change just about everything we use to take for granted about education.
* Using AI systems, software and support, students can learn from anywhere in the world at any time.
* Educational programs powered by AI are already helping students to learn basic skills.
* As these programs grow and as developers learn more, they will likely offer students a much wider range of services.
* The result? Education could look a whole lot different a few decades from now.

**Employability and AI**

* The substitution of human labour by AI and robots is a keenly debated topic.
* It is claimed that a substantial share of jobs is at risk.
* Some other people think the advanced technology will lead to product innovations and hence to an unimaginable new occupations and the new jobs.
* Over all, it is believed that a positive impact on business and negative impact on employment.
* Firms with highly skilled work-force are optimistic than the firms with low skilled employees.
* Computers and robots are expected to create new products and services and that these product innovations will result in unimaginable new occupations.
* AI is driving great advances in medicine and health care with better disease prevention, higher accuracy diagnosis and more effective treatment and cures.
* A two-year study suggests that by 2030 intelligent agents and robots could replace as much 30% of the world’s current human labour.
* Despite the fears and concerns, every technological shift has ended up creating more jobs than were destroyed.
* Fears and concerns regarding AI and automation are understandable but ultimately unwarranted.
* Technological change may eliminate specific jobs, but it has always created more in the process.

**Types of AI careers**

* A career in AI can be realized within a variety of settings including private companies, public organizations, education, the Arts, healthcare facilities, government agencies, military etc, etc.
* Software analysts and developers.
* Computer scientists.
* Algorithm specialists.
* Mechanical engineers and maintenance technicians.
* Manufacturing and electrical engineers.
* Surgical technicians working with robotic tools.
* Medical health professionals working with artificial limbs, prosthetics, hearing aids and vision restoration devices.
* Military and aviation electricians working with flight simulators, drones and armaments.
* Graphic art designers, digital musicians, entertainment producers.
* Textile manufacturers and architects.
* Post secondary professors at technical and trade schools, vocational centres and universities.

**Currently AI is used in the following fields/things**

* Virtual assistant or chatbots.

*Alexa, Siri, and Google Assistance are the major examples of the virtual assistance services while automated bots answering the questions of customers are the examples of AI based chatbos working with best performance.*

* Agriculture and farming. In agriculture sectors autonomous tractors and drone monitoring are used to enhance the productivity and crop yield of farm lands.
* Robots and automated machines are also used in these fields to monitor the health condition of crop and harvesting.
* Autonomous vehicles or self-driving cars are the other examples of AI, fully integrated into such system to make the machine work automatically while understanding the nearby surroundings and real life scenario of the environment.
* Autonomous flying.
* Retail, shopping and fashion.
* Security and surveillance..
* Sports analytics and activities.
* Live stock and inventory management.
* Self driving cars and autonomous vehicles.
* Healthcare and medical imaging analysis.

AI is playing a vital role in Healthcare sector in empowering the machines to diagnosis, analyze and predict various types of the diseases, monitor the patients’ health conditions and help scientists to explore the new drug discoveries and medicine development helping people to get well soon and avoid the health problems in their life.

* Warehousing and logistic supply chain.
* AI is now getting integrated into multiple fields, and further there is too much scope to penetrate new fields and industries to improve their efficiency and productivity.
* Everything depends upon the availability of training data of related field to train the algorithms and develop the right AI model which can work flawlessly in respective fields.

***AI will take some tasks off the teachers’ hands, allowing them to focus elsewhere. With AI grading students, developing a personalized curriculum, identifying gaps, creating smart content and making education more accessible, the teachers will become coaches or facilitators.***