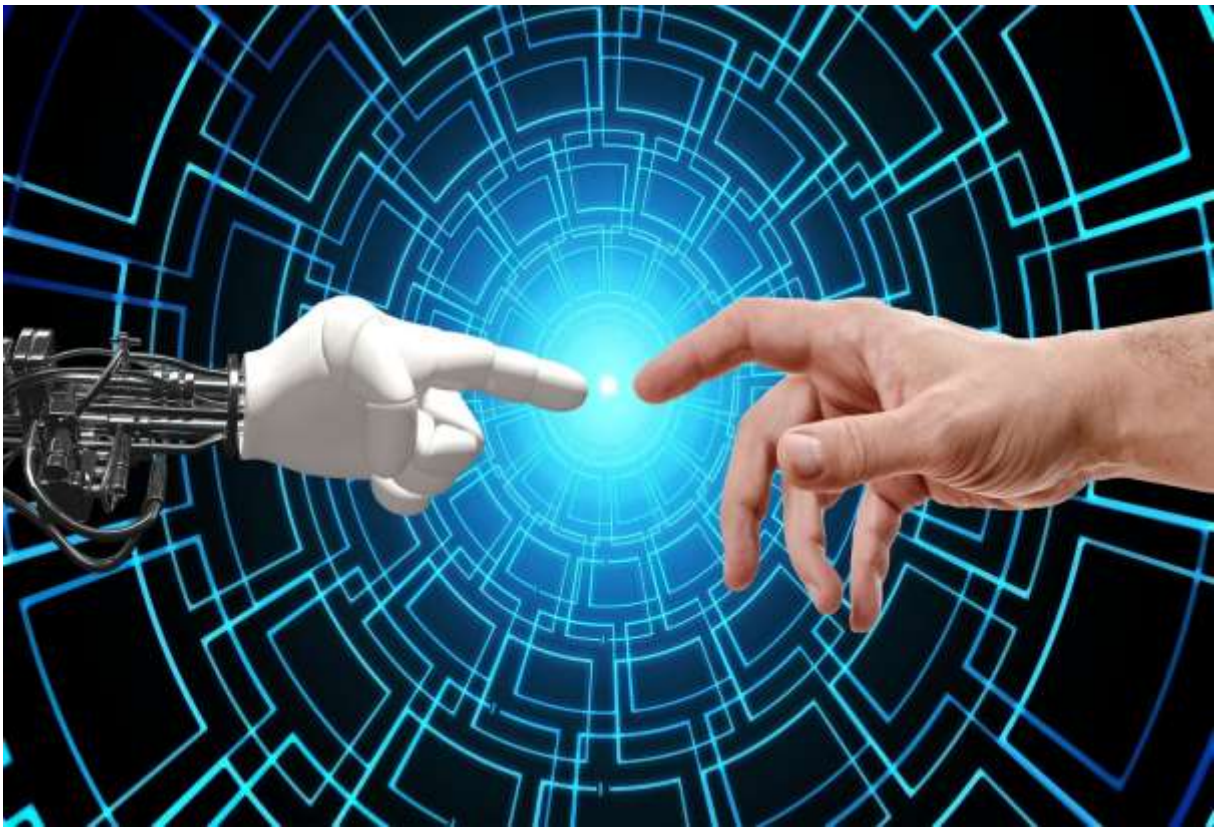
Artificial Intelligence: Emerging opportunities for the science and education sectors

Introduction



Source:https://pixabay.com/photos/technology-developer-touch-finger-3389904/

Have you ever heard or seen an advertisement showcasing a new smartphone or technological product harnessing the power of Artificial Intelligence (AI)? AI is all around us whether we realize it or not and is influencing both our professional and personal lives to a great extent. For some, AI is about artificial life-forms that can surpass human intelligence, and for others, almost any data processing technology can be called AI.

There is a lot of marketing hype about AI, but taking a selfie with your smartphone is probably the most common use of an AI model. It will recognize that there is a human face, it will locate its position and will help your phone camera to focus on it.

Many predictions about the near future suggest that in the coming years, many industries will be transformed by the power of AI including healthcare, bioscience, finance and education.

Against this backdrop, the main objective of the present module is to provide necessary information in a simple and clear manner so the reader can readily understand the utility of AI and the ways in which it can be used both in every day life and in adult education.

The reader will also be able to understand the basic tenets, characteristics and benefits of AI, and explore the concepts of Machine Learning and Neural Networks which are part of AI.By the end of this module, the reader will learn:

- The characteristics of AI
- The concepts and benefits of AI in daily life
- The different ways AI can enhance adult education
- The different characteristics of Machine Learning and Neural Networks

Introduction to Artificial Intelligence

AI is a topic that has been talked about a lot in recent years. Information from both media coverage and public discourse are almost impossible to avoid. But what is AI exactly?

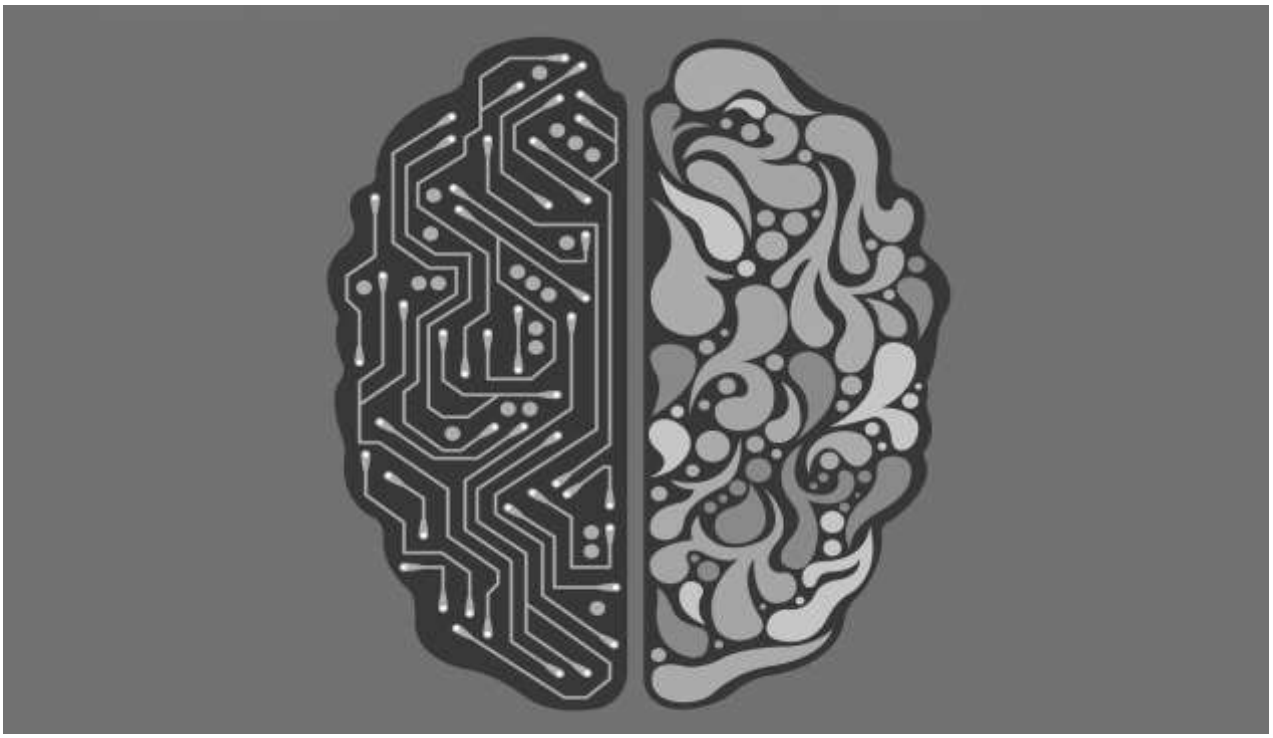
In computer science, AI refers to the intelligence demonstrated by machines, in contrast to the natural intelligence displayed by humans.

Colloquially, the term AI is often used to describe machines (or computers) that mimic cognitive functions that humans associate with the human mind, such as classification, pattern recognition, natural language processing, language translation, time series prediction. learning and problem-solving.

In more simple words, AI can improve the speed, accuracy, and efficiency of human efforts. AI techniques we will cover in the following chapters can be used in many different ways and implemented in a lot of today's technologies.

Although a basic concept of AI has been around from 1950, the first decade of the 21st century, the scientific community turned their attention to AI for growth, especially so when machine learning (which we cover in the following chapter) was effectively applied to problems both in academia and in the industry through which new solutions emerged.

Nowadays, AI applications are used in a wide range of fields including the medical and finance sector, law, data and many more.



Source: https://pixabay.com/el/illustrations/τεχνητή-νοημοσύνη-ai-ρομπότ-android-2228610/

The characteristics of Artificial Intelligence

In this section, we will talk about AI characteristics.

As we know, AI is currently transforming the way we live and the way we work. Many industries have already started investing in this technology. Big technology giants like Google and Microsoft use AI frameworks to make their products better and to reduce production costs and overheads.

Below are shown domains that AI can be used in a number of ways.

- **Object detection, classification and recognition:** A special case of can be face detection and face recognition. More complex cases include analyzing a street view and detecting other vehicles, pedestrians, traffic signs, buildings etc. in a self-driving car system.
- **Time Series Prediction:** AI models that can predict weather, electricity demand, stock prices
- **Natural language processing and translation**
- **Speech recognition**
- **Artificial Neural Networks:** AI networks that can be help self-driving cars.
- **Deep Learning:** Deep learning algorithms, which is a component of AI, can be used for a variety of functions, e.g., foreign language translations of high accuracy

Source: https://www.pexels.com/photo/high-angle-view-of-a-man-256381/

A presentation of some basic AI characteristics follows.

AI, in the near future, will be able to suggest solutions for our existing problems

As humanity is faced with increasing and complex challenges such as environmental issues, socio-economic inequality, untreatable chronic illnesses and others, different AI models can help us tackle problems faster in comparison to previous years. This is a great advantage for research institutes that are currently trying to find solutions to these problems.

As an example, with the help of AI models, scientists can make more accurate predictions on weather outcomes. Consequently, the more data is collected and these models take into account, the better the results and predictive ability of AI.

AI can help us to work with a large amount of information

In the past, scientists and professionals have struggled to process large and complex data sets due to limited computer processing capabilities and old algorithm techniques. AI has changed this. AI can now process large amounts of complex data and produce reliable results quickly and at low cost.

Financial institutions all around the globe are utilizing the power of AI. For example, banks process millions of transactions for their customers on a daily basis. This is made possible by using specific AI models that process all this information and provide accurate data about transactions, lending risks, etc.

Source: https://www.pexels.com/photo/blur-close-up-code-computer-546819/

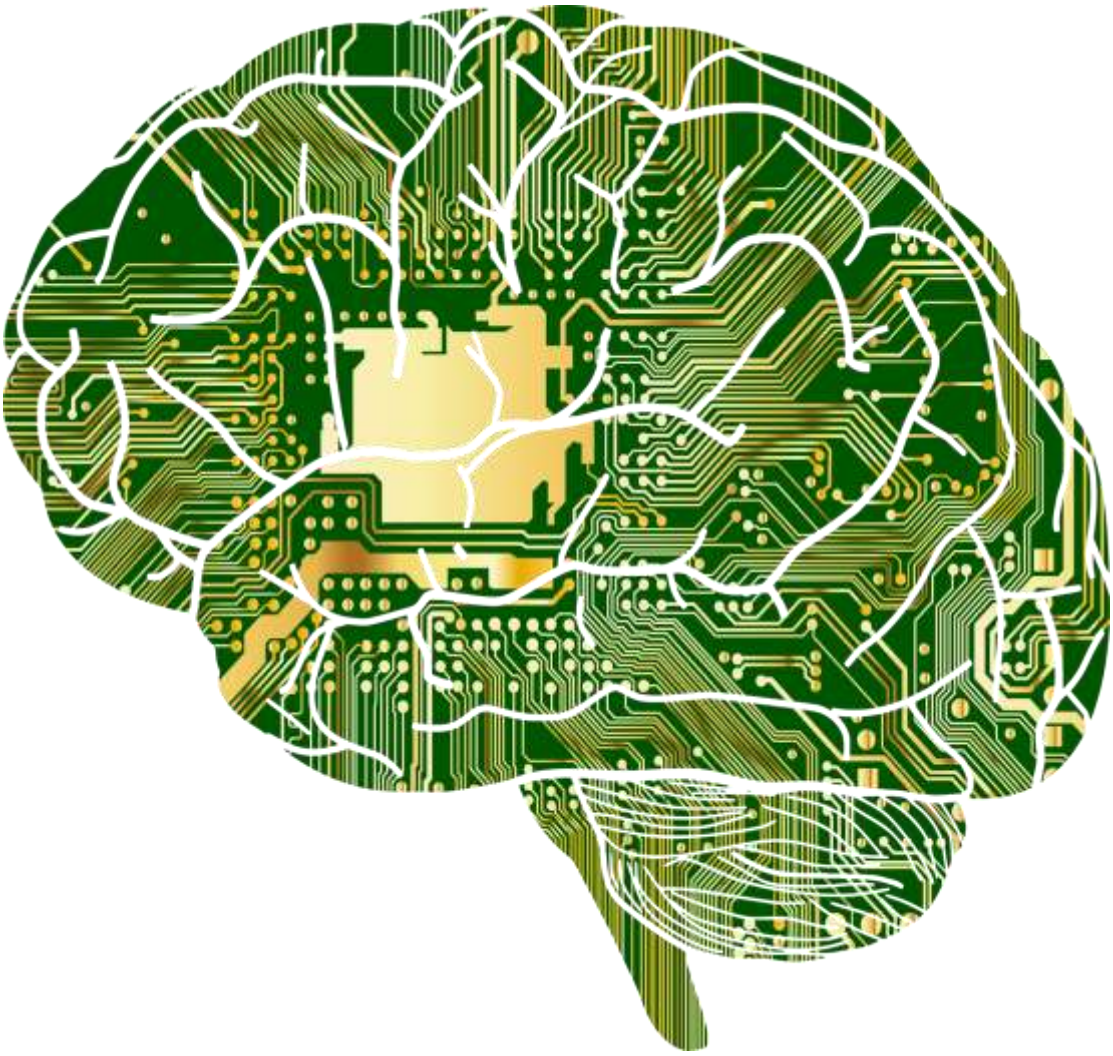
AI algorithms can learn and adapt

The learning and adaptability of AI algorithms is key characteristics. In practice, this means that AI can automatically adapt its algorithm technique according to the data available and generate results faster than regular algorithms could do.

Nowadays, a lot of online marketplaces employ AI software to predict and suggest to their customers products that might be similar to what they are purchasing.

AI can help with fast decision-making processes

Another unique characteristic of AI that will come in greater potentials in the future, is its fast decision-making process ability. This AI process can help businesses and research centers to make data-driven decisions with great predictive ability



Source: https://pixabay.com/vectors/anatomy-biology-brain-thought-mind-1751201/

The concepts and the benefits of Artificial Intelligence in daily life

As already previously mentioned, AI has drastically improved our way of life even in ways that are often not visible or easily detectable. The aim of this chapter is to identify some of the concepts and the benefits of AI in our daily life.

Self-driving and parking vehicles

Deep learning technology, a subset of AI**,** is currently used in self-driving and parking car technology. It allows for the system to recognize the available space and objects around a vehicle. In the not so distant future such technology will be available in an increased number of models by car manufacturers creating a more enjoyable and captivating driving experience.

Source: https://www.pexels.com/el-gr/photo/los-angeles-tesla-tesla-x-2526127/

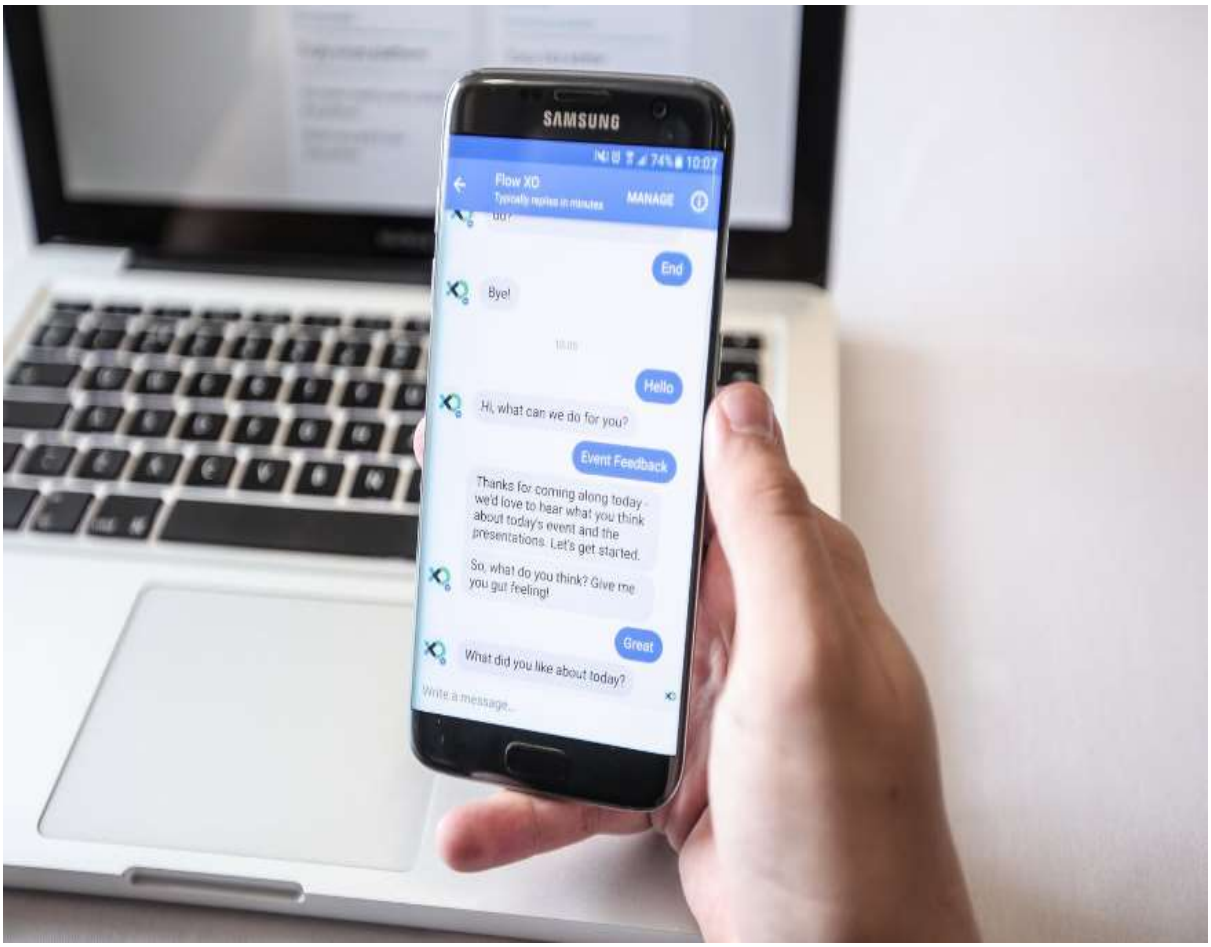
Automation of large and repetitive tasks

AI is now so powerful that many companies use it in their business processes and systems to achieve faster and higher quality results. For example, one repetitive and resource-intensive process for many companies is the recruitment process due to the high volume of applications that are submitted for jobs. HR departments have to screen a large number of applications and applicants' resumes – a process that is costly both in terms of time and manpower. In this case, AI is able to quickly sort through applications and resumes, and assist hiring managers in screening applicants based on criteria (e.g., qualifications, years of experience).

Internet chatbots

Chatbots powered by AI are frequently used by many companies in an effort to automate tasks like support for customers who have common questions about products or services. In the near future, it is believed that chatbots' responses will be so accurate that it will seem like one is talking to a real person.

For instance, the chatbot conversation shown in the image below depicts AI being used for event feedback.



Source: https://www.pexels.com/photo/bot-cellphone-chat-bot-chatbot-190362/

Ride-sharing and delivery applications

These days, there are several ride-sharing and food (or product) delivery services applications that can use AI software to determine the distance locations. This, allows for fairly precise predictions regarding expected delivery or pick up time relative to the distance between you and the driver.

Source: https://pixabay.com/el/photos/foodora-ποδήλατο-παράδοση-δρόμο-3402507/

Product and music recommendations

Think back to all the times where while you are shopping or browsing at an online store you receive a pop-up recommending similar products to the ones you are searching for? Guess what – that is AI. AI gathers information about your preferences and purchasing habits. AI then personalizes your shopping experience by suggesting new products that are tailored to your habits (and often make you buy more products than you actually need).

Source: https://pixabay.com/photos/headphones-earphones-mobile-phone-2789078/

Similarly, many music streaming services track customer listening habits and suggest songs and artists. Based on AI software, some music applications take into account factors like weather and time of day to offer music that can set the mood for activities.

Security and surveillance advanced technology

Security and surveillance software are also affected by AI. Humans are unable to monitor multiple screens with feeds from hundreds – if not thousands – of cameras at the same time, however, AI makes this job look almost effortless. Object and facial recognition technologies are getting better by the day and soon AI will take over this difficult task.

Source: https://pixabay.com/el/illustrations/αφηρημένο-φόντο-μπαρ-γαλανός-2339623/

Online and personalized advertisement network

Nowadays, a lot of advertising companies use the power of AI in their online campaigns and track users based on statistics that are produced while they are surfing online. Without AI, the online advertising industry would simply fail as ads would be shown to users randomly with no connection to their preferences.

Using AI, advertisers are able to target different segments of individuals with appropriate ads increasing the chances of acquiring a new customer. That being said, there remain concerns regarding privacy and the collection of data.

Better maps and accurate directions

Computer and smartphone navigation applications like Google or Apple Maps usually combine parts of their code with AI to calculate traffic and find the quickest route to your destination to find shops that you are interested near you, and others.

Source: https://www.pexels.com/photo/smartphone-car-technology-phone-33488/

The different ways Artificial Intelligence can be of help in adult education

Among the many capabilities of AI includes building the future of adult education. In this chapter, we examine different ways AI can enhance adult education procedures.

Improve accessibility methodologies for education

Accessibility and inclusion for all kinds of learners is absolutely necessary in today's society. That is because there should be equal opportunities to learn and study for everyone. So, the future of studying certainly includes online courses that can be accessed by everyone with the help of AI. To see how useful AI can be for partially sighted people take a look at Microsoft's Seeing AI app (https://www.microsoft.com/en-us/ai/seeing-ai).

For example, in the near future, educators will let AI generate alternative text for images and captions for videos and as a result, achieving higher rates of inclusion.

AI-driven programs can give students and educators helpful feedback

AI can help educators and learners craft courses that are customized to their needs, and can also provide feedback to about the success of the course as a whole.

Some online teaching platforms offer AI systems to monitor learner progress and to alert educators when there might be an issue with learner performance.

This type of AI systems allows learners to get the support they need and trainers to identify areas where they can improve instructional sets and guidelines for those who may struggle with the subject matter.

Artificial Intelligence can point out necessary improvements for a course

Educators may not always be aware of mistakes in their lectures or educational material that can leave learners confused about certain concepts.

AI offers a solution to this problem. As an example, Coursera, 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 instructor and gives future students a customized message that offers hints to the correct answer.

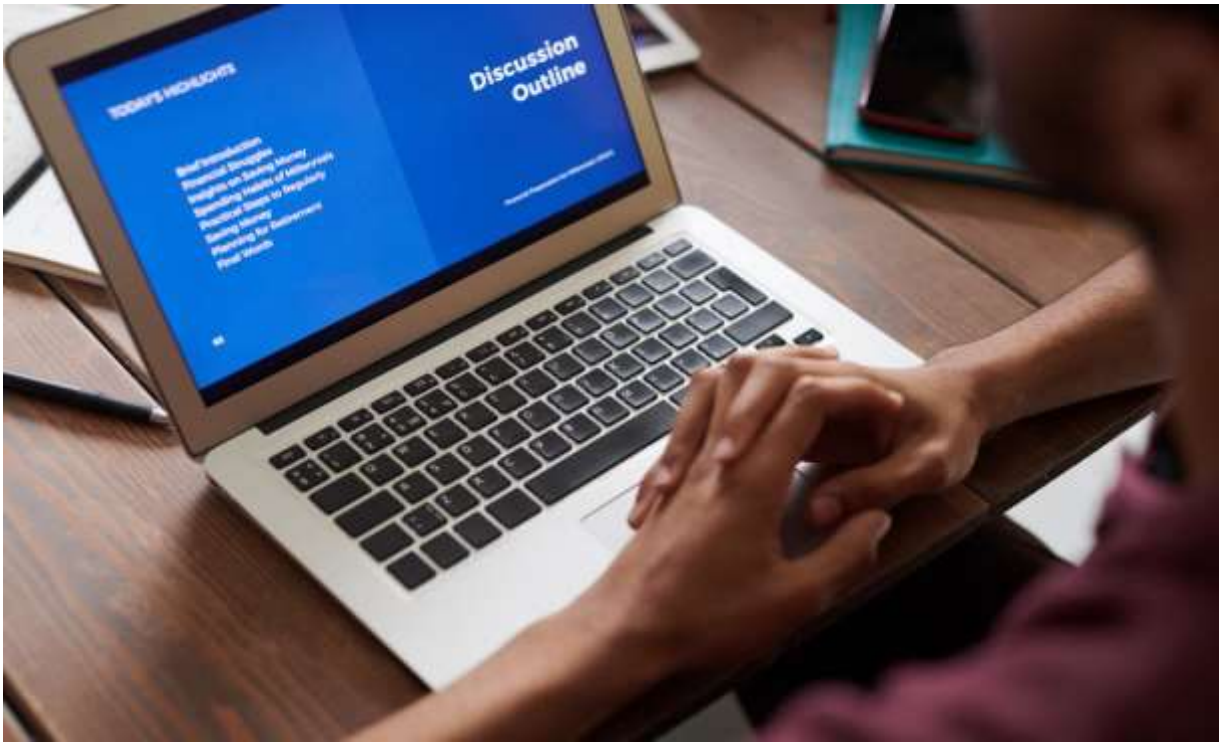
This type of system helps fill in the gaps in the delivery of modules (e.g., lecture slides), and helps ensure that all students are building the same conceptual foundation. Rather than waiting to hear back from the instructor, students receive instant feedback helping them better understand the content and perform better.

Source: https://pixabay.com/el/illustrations/βίντεο-διάσκεψη-σε-απευθείας-σύνδεση-5167472/

Personalized learning content and material

A major limitation of distance learning courses is that often times, the course content is not personalized to the needs of students. As the course is delivered exclusively online, learners are completely reliant on the course content (as opposed to face-to-face lectures, workshops, etc.). Providing one-size-fits-all content to all students may not lead to optimal learning outcomes. That is due to different learning styles of people that needs to be taken into consideration.

AI is able to change this. Instead of training all them with similar content, AI can personalize the content relative to individual needs and job function. This will help all employees to take advantage of the new knowledge and help them succeed in their role.



Source: https://www.pexels.com/el-gr/photo/3184170/

Tutoring systems with the help of AI

AI can revolutionize the traditional way of tutoring by introducing intelligent tutoring systems. These systems are essentially software that has been built to emulate a human tutor.

This special AI software can bring customized feedback and responses to learners according to their inquiries as if it was a real person next to them.

In adult education, the use of such a system could potentially imply the integration of intelligent tutoring systems into existing learning systems and e-learning platforms. This could provide valuable feedback and personalize feedback to any adult learner.

Imagine being an online learner that uses an advanced learning platform where the tutoring system is a chatbot and guidance is provided by specialized AI software that can be accessible at any time and from any of your devices.

We have to highlight that this kind of intelligent systems was not designed to replace humans in any way, on the contrary, such systems can provide additional feedback and support to the learners, making the process smoother.

Source: https://pixabay.com/photos/learn-school-laptop-tablet-4229622/

Distance learning experience

Distance learning and the learning experience of the adult population requires a different approach primarily because adults are used to being in taught in person and not from distance.

Through personalized content and efficient learning methodologies, AI learning platform systems can help adult educators deliver better results through their work. This can be achieved by ensuring that training is delivered in the most efficient way possible.

AI has the potential to disrupt continuing education by enhancing and accelerating the learning process and providing a personalized learning experience.

Source: https://pixabay.com/illustrations/online-education-internet-3412498/

The characteristics of Machine Learning and Neural Networks

In the previous sections of our course, we went through AI characteristics and how AI it can help in different ways. Now in this one, we will talk about Machine Learning and Neural Networks which are subsets of AI.

Machine learning refers to the field studying computer learning processes without being explicitly programmed.

Machine learning algorithms help technologies step into a mode of self-learning without being programmed to do so. This kind of program can learn new techniques and change their code on their own when new data is inserted.

Automated data visualization

We previously discussed large data sets that AI is capable of handling. It is necessary that these data outcomes can be visualized in order to be understood. A characteristic of machine learning is that it helps AI visualize noteworthy patterns found in the data. After that, with the help of machine learning platforms, businesses can utilize information that is useful to them.

In the context of adult education, complex numerical information or other content may be easier understood using visualization techniques.

Source: https://www.pexels.com/photo/lines-of-code-2653362/

Automating

A lot of companies and organizations are require that repetitive tasks are performed for their day-to-day business operation. A need to automate repetitive tasks was evident and necessary, however, in past years, this was incredibly difficult and costly.

An important contribution of machine learning in this context is its ability to automate repetitive tasks like email messages (e.g. sending automated messages).

In adult education, this can help educators answer common questions submitted by learners allowing them to focus on more important educational content.

Accuracy in data analysis

Nowadays, data analytics are essential in businesses of all sizes as they provide vital information through large and complex data sets.

Machine learning is the best solution to all the aforementioned issues. Fast and efficient program algorithms and real-time analysis models can generate results with a high level of accuracy. The companies can use these results to improve their services and make better decisions.

For example, in adult education, this can help trainers process information about student behaviors and adapt new teaching methodologies accordingly.

Source: https://www.pexels.com/photo/abstract-achievement-bright-business-614117/

At this stage, we will cover **artificial neural networks** (ANN), also known as connectionist systems. ANN are computing systems that assimilate the biological neural networks of animal brains. ANN can be supervised or unsupervised – the two categories are summarized below.

Supervised artificial neural networks

Supervised ANN is defined as matched input and output samples of data that are provided to the network for training.

An everyday example of a supervised network are spam filters that can be found in e-mail service providers such as Hotmail or Gmail. These networks analyze millions of e-mails and following data generation, email messages are flagged as either spam or safe emails.

Unsupervised artificial neural networks

Unsupervised ANN is defined as a data set with no pre-existing labels requiring minimum human supervision and characterized by high complexity when compared to the supervised ANN**.**

The most common unsupervised learning method is cluster or segmentation analysis, a statistical analysis technique used to identify hidden patterns or grouping in data.

Source: https://www.pexels.com/el-gr/photo/ilight-373543/

Characteristics of artificial neural networks

Any ANN, irrespective of the style and implementation logic has a few key characteristics:

- The processing elements have a large number of connections between them.
- The connections between those elements provide a spread representation of data.
- A learning process is implemented each time in order to obtain more knowledge.

Final Quiz

1. Artificial intelligence is

   a) A TV series

   b) A program that we can install in a computer

   c) Intelligence demonstrated by machines

   d) An application for our smartphones

2. Artificial Intelligence can improve

   a) Speed

   b) Accuracy

   c) Efficiency

   d) All of the above

3. Some known characteristics of AI are

   a) That can learn and adapt fast

   b) That can help us to work with a large amount of information

   c) That it will replace adult educators

   d) That it can replace humans

4. What is the benefit of Artificial Intelligence in daily life

   a) Making people run faster

   b) Making cars automated

   c) Help music apps to recommend music

   d) Making map applications more accurate

5. How Artificial Intelligence can be of help in Adult Education**?**

   a) By personalized learning content and material

   b) By replacing adult educators

   c) By improving the distance learning experience

   d) None of the above

6. Machine Learning is

a) A method for educators to learn how to use a machine

b) A learning concept for a computer making

c) A method for making better car machines

d) A field of study that gives computers the ability to learn without being explicitly programmed

7. Is machine learning a subset of artificial intelligence?

a) Yes

b) No

8. A characteristic of Machine Learning is

a) **The ability to perform automated data visualization**

b) The ability to make cars fly

c) The ability to make humans immortal

d) None of the above

9. Supervised Artificial Neural Networks is

a) a data set with minimum human supervision

b) a matched input and output samples of data is provided to the network for training

c) data analytics for small or big business units

d) an online chatbot

10. A characteristic of Artificial Neural Networks is

a) A learning process is implemented to acquire knowledge

b) A distance learning experience

c) A portable network application

d) None of the above

Additional resources

- School of AI is a free high-quality content platform for easy use of AI: https://soai.world/
- Deep Cognition is a simple but powerful GUI where you can drag and drop neural networks and create Deep Learning models. https://deepcognition.ai/
- How can AI help tackle climate change? https://towardsdatascience.com/how-can-technology-and-artificial-intelligence-help-tackle-climate-change-b97db0ff4c95
- How Machine Learning Algorithm is helping the Google Maps https://in.springboard.com/blog/implementing-machine-learning-algorithms-in-google-maps/
- Google learn for AI https://ai.google/education/
- 30 Free Resources for Machine Learning, Deep Learning, NLP & A https://www.kdnuggets.com/2018/06/30-free-resources-machine-learning-deep-learning-nlp-ai.html
- 8 Digital AI Resources for when it comes to artificial intelligence https://rasa.io/pushing-send/ai-resources/
- ARTIFICIAL INTELLIGENCE IN EDUCATION https://www.iste.org/learn/AI-in-education
- Learning about artificial intelligence: A hub of MIT resources for K-12 students http://news.mit.edu/2020/learning-about-artificial-intelligence-hub-of-mit-resources-k-12-students-0407
- How can we teach students about artificial intelligence https://www.gettingsmart.com/2019/01/teaching-students-about-ai/
- A professional learning suite of online and in-person experiences crafted by and for educators. https://www.mymindsparklearning.org/ibm-ai-education
- Ten best aplication bulided with the help of Artificial Intelligence https://www.devteam.space/blog/10-best-ai-apps/
- 12 COMPANIES USING AI IN EDUCATION TO ENHANCE THE CLASSROOM https://builtin.com/artificial-intelligence/ai-in-education