



Digital bytes

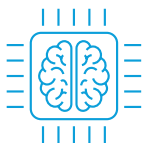
THE 'WHAT', 'HOW' AND 'WHY' FOR EDUCATION

Answering basic questions on...

Artificial Intelligence in Digital Education

What it is?

Artificial intelligence (AI) refers to machines or algorithms that are capable of observing their environment, learning from it and, based on the knowledge and experience gained, take intelligent action or propose decisions. AI has many definitions as it is used to describe a range of technologies, from an algorithm or app to machine learning and neural networks. AI is used in our everyday life to provide, for example, automatic language translation, subtitles in videos or block email spam.

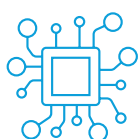


How does it work?

AI-based systems can be purely software-based (voice assistants, image analysis software, search engines, speech and face recognition systems) or can be embedded in hardware devices (advanced robots, autonomous cars, drones or Internet of Things applications). Today, many AI technologies use a data-based approach, which means they require data to train algorithms and improve their performance to make better predictions. Once they perform well, they can help improve and automate decision-making.



Why is it significant?



AI is not just for technologists. We live in a society increasingly mediated by digital technologies, and where AI is becoming ubiquitous.

AI has the capacity to process huge data in a short timeframe, automate specific tasks and quickly provide information requested. AI is also significant for the profound impact it is and will have on the economy, labour markets, and in turn on education. AI may lead to tasks and jobs being automated, hence requiring a redefinition of competences needed. We could also face a growing shortage of AI specialists, which means investing in programmes and courses on AI at different levels of education.

Education and AI?

AI can be used in education to assist educators and learners in the assessment process and automate certain activities, or parts of activities, such as grading and feedback. For example, [L2TOR](#) (an EU funded H2020 project) so called 'social robots', assist the teacher with more routine tasks teaching a second language to preschool children. Through 'intelligent tutoring systems', AI can potentially offer a personalised and inclusive learning approach tailored to the capabilities and needs of individual learners. As such, AI may change where students learn, who teaches them, and how they acquire basic skills. For example, learners of the future may have vastly different experiences in accessing information, knowledge, and learning resources. Integration of AI in educational systems could imply the development of new transversal, soft and agile skills for all stakeholders (students, teachers, school leaders and policy makers) to work in partnership with the capabilities that AI brings.





What are the concerns?

A significant concern regarding AI is the usage of data. If data used to train AI systems are biased, then results produced by these systems may be questionable. Prejudice is hidden when data, for example, are unrepresentative or reflect discrimination in society. Furthermore, access and availability of large quantities of data could have consequences for privacy and surveillance. Even anonymised data can become less secure as AI could potentially be used to identify individuals. In education, the use of AI could inadvertently scale-up and automate bad pedagogical practice as well as raising ethical questions.



Where is it going?

AI is embedded in many of the technologies that have been changing our economy and society over the last decades. However, the future of AI is uncertain. Experts argue that AI systems will be built to support human needs and increase our capabilities, for example with personalised medicine. AI advocates even argue that 'superintelligent' computers could solve complex global problems, such as climate change. In education, using AI could generate new insights into how learning happens and it may also change create new challenges for educational institutions, such as the need to train a specialised AI workforce.



What the European Commission is doing about this?

The European Commission adopted the [Communication Artificial Intelligence for Europe](#) in 2018 and [Building Trust in Human Centric Artificial Intelligence](#) in 2019, plus a [Coordinated Plan on AI](#) with member states in 2019. The series of measures includes factsheets, ethical guidelines for AI development and use, a European AI Alliance forum, and a systematic monitoring on AI developments, including policy initiatives of EU Member States. The Commission also invests on policy, research and innovation in AI for Education. In the frame of the [Digital Education Action Plan](#), adopted in January 2018, AI pilot projects to predict future skills and skills shortages are foreseen, and a foresight report on AI in education came out in 2018. Under H2020 funding, Erasmus+ launched the Digital Opportunity traineeship initiative that provides cross-border traineeship opportunities for hands on digital experience – including AI. Additionally, Marie Skłodowska-Curie actions (MSCA) support projects in the area of AI, which are increasing in the area of Innovative Training Networks for PhD candidates and Research and Innovation Staff Exchanges for collaborative projects in AI.



Key Terms

Algorithm

An algorithm is a detailed set of instructions rules that enables a program to perform a specific action. It is a bit like a mathematical equivalent of a recipe for cooking a dish. A set of rules to be followed in problem solving operations - computers in particular.

Big Data

Big data refers to data sets that are too large and complicated to be analysed using simple algorithms and require to be analysed through more complex data analytics or machine learning.

Neural Networks

Neural networks are a form of AI inspired by the structure of the human brain. They are made of processing nodes (artificial neurons) which are connected in layers. Each node receives data from nodes above it, and passes this down to nodes below it. Data has 'weight' attached to it by the nodes, which attribute value to the data. If the data does not pass a certain threshold, it is not passed on.

Machine Learning

Machine learning (ML) is one (among many) ways to achieve AI. It is a computer system that learns from data, rather than one that just follows a set of rules. When provided with sufficient data, a machine learning algorithm can learn to make predictions or solve problems, such as identifying objects in pictures or playing a particular game, for example.

Narrow AI

An AI system which can handle just one particular task.

Supervised Learning

Supervised learning is based on training data that has been labelled, so that the network weights can be adjusted when the labels for training data are wrongly predicted. After significant number of examples provided, in most cases the error can be reduced to a level where predictions of the network become useful for practical proposals.

Robotics

Robotics is a branch of engineering that involves the conception, design, manufacture, and operation of robots. This field overlaps with electronics, computer science, artificial intelligence, mechatronics, nanotechnology and bioengineering.

General AI

An AI system which is able to cope with any generalised task which is asked of it. General AI does not yet exist, and is unlikely to exist in the near future.

Unsupervised Learning

In unsupervised learning, algorithms are left to their own devices to discover and present the interesting structure in the data. Unlike supervised learning, unsupervised machine learning algorithms infer patterns from a dataset without reference to known or labelled outcomes. The goal for unsupervised learning is to model the underlying structure or distribution in the data in order to learn more about the data.



Suggested reading:

- o Annoni, A. et al. (2018). *Artificial Intelligence: A European Perspective* (No. JRC113826). European Commission, Joint Research Centre.
- o Baker, T. et al. (2019), *Educ-AI-tion Rebooted? Exploring the future of artificial intelligence in schools and colleges*, NESTA.
- o Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial Intelligence In Education: Promises and Implications for Teaching and Learning*.
- o Luckin, R. et al. (2016). *Intelligence Unleashed: An argument for AI in Education*. Pearson Education, London.
- o Russell, S. J. (2017). *Provably beneficial artificial intelligence*. Exponential Life, The Next Step.
- o Tuomi, I. (2018). *The Impact of Artificial Intelligence on Learning, Teaching, and Education* (No. JRC113226). European Commission, Joint Research Centre.