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Artificial Intelligence and Machine Learning

Artificial Intelligence (AI) enables computers to mimic human intelligence. Machine Learning (ML) enables computers to perform a specific task without explicit instructions.

Many everyday devices and software such as GPS maps, smart phones, and online shopping websites use AI/ML technologies to provide increased functionality. Such technologies are also being used in the industry for increasing manufacturing efficiency, analyzing financial risk, and even detecting cancerous cells in the human body.

Terms such as AI, ML and Deep Learning (DL) tend to be used interchangeably. The graphic on page 2 shows the distinction between these terms.
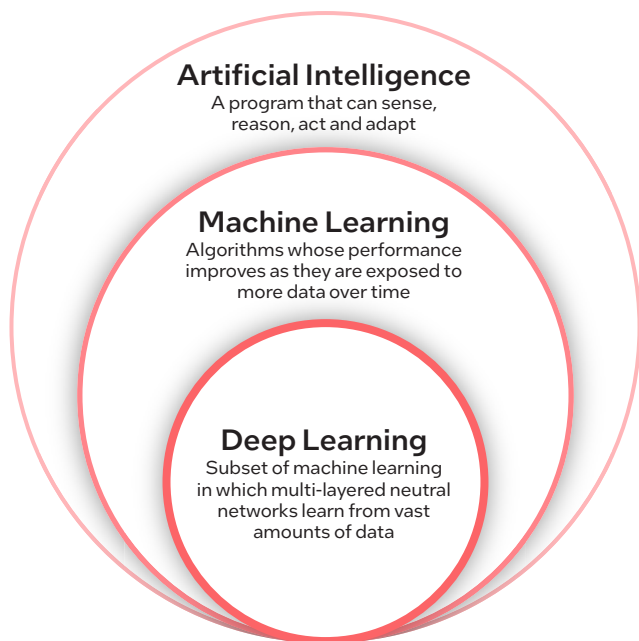

In the K-12 education system, AI and ML have many uses, including the development of personalized learning solutions: customizing curricula and pacing the lessons based on student needs, or even identifying at-risk students. Using AI, elementary school students can learn to use robots that recognize emotions, and middle school students can create musical compositions. More advanced learners can use ML to solve real-world problems—for example, to sort waste for recycling or to classify bacteria found in various locations.

Just as schools used to teach basic typing skills or computer skills, schools will now need to teach computational skills so that people who work with machines can successfully interact with them. This is particularly so because nearly all future jobs will most certainly be augmented by AI to some degree.

As applications of AI and ML grow, more jobs will require workers to use machine learning models, perform computer vision tasks, process natural languages, and implement robotics. These are useful sub-skills for learners to develop in school which the Intel® Skills for Innovation (Intel® SFI) Framework addresses:
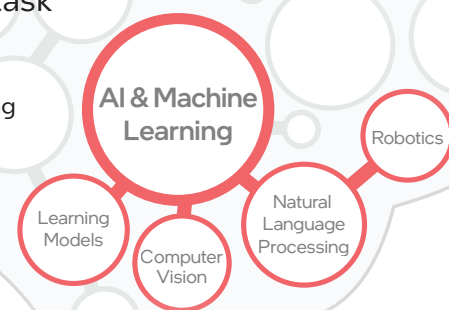
1 **Learning models** train computers to sort through large databases of events, identify similarities and differences among events, and classify events based on the algorithms the computer has learned. These can supplement STEM learning and help students apply theories in a wide range of real-world situations. .

2 **Natural language processing (NLP)** refers to technology that allows humans and computers to communicate using the human language. NLP can supplement language lessons and facilitate deeper exploration of linguistics including various elements of style, literary devices, and subtext.

3 **Computer vision** uses image and video data to classify similar patterns. This has many uses, including facial recognition for security access, analysis of traffic patterns to plan stoplights, crosswalks, and parking places, or even analyzing human movement and gestures. In the classroom, it can help students take different perspectives into account in their approaches to problem-solving across all subjects.

4 **Robotics** uses AI technologies to learn and mimic human movement in order to automatically control the movements of robots. This is useful across the full range of STEM subjects, allowing students to safely simulate the outcomes of experiments or use robots to collect the data they need.

Artificial Intelligence
A program that can sense, reason, act and adapt

Machine Learning
Algorithms whose performance improves as they are exposed to more data over time

Deep Learning
Subset of machine learning in which multi-layered neutral networks learn from vast amounts of data

Source: intel.sg/content/www/xa/en/artificial-intelligence/posts/difference-between-ai-machine-learning-deep-learning.html

To support educators in integrating AI and ML skills into their everyday teaching, the Intel SFI Framework and its components provide several resources that embed the use of such technologies in a variety of subjects across grade levels. The table below presents some examples from the Intel SFI Starter Pack, which suggests classroom activities for integrating AI and ML, and the Intel SFI Professional Development Suite, which enables educators to create their own AI and ML technology-integrated lesson plans.

> Accelerating the development of students' AI and ML skills will help them navigate future workplaces that will be characterized by increasing levels of data availability and computing power. It will help them use AI to augment their work effectively and improve their overall performance.

Resource	Module/Activity	How Skill Is Addressed
Intel SFI Starter Pack	Are You Happy?	**Learning Models:** Learners use Natural Language Processing and machine learning to create a machine that can detect emotion. In the process, they gain a deeper understanding of what respectful, appropriate online conversations look like.
	AI Roleplaying (ChatGPT)	**Natural Language Processing:** Combining generative AI (ChatGPT), role-playing, and creative writing skills, learners step into the shoes of different characters and actively participate in simulated scenarios to create a machine that can detect cyberbullying.
	Eyes on Wildlife	**Computer Vision:** Using Python and Jupyter Notebook, learners create motion detection algorithms that can help rangers detect and deter wildlife poaching. This activity brings an important contemporary issue to life and shows how technology can be used to develop viable solutions.
	Motion Behavior Robotics	**Robotics:** Learners will apply their knowledge of human anatomy to successfully animate a humanoid robot in a 3D space.
	Pathos, Logos, Ethos (ChatGPT)	**Natural Language Processing:** Learners use generative AI (ChatGPT) to analyze advertising persuasion techniques. This activity guides them to create a chatbot that can identify three marketing techniques: pathos (evoking emotion), logos (appealing to logic), and ethos (creating credibility).
	Robotic Conversations Robotic Simulations	**Robotics:** In this interactive physics activity, learners apply simulation techniques to robotic designs to evaluate how effectively they accomplish a specific task. By fine-tuning robot designs virtually, learners can deduce how simulation techniques reduce the cost and accelerate the speed of prototyping.
Intel SFI Professional Development Suite	Critical Reasoning to Make Better Decisions	Educators learn about the functions of chatbots in this course.
	Establishing Effective Educator-Machine Relationships	This course identifies various risks and pitfalls of using technology and machine learning in a school environment and encourages educators to think of solutions to overcome these risks.
	Generating Ideas for Teaching and Learning Using Artificial Intelligence	Educators integrate AI tools into an engaging lesson on generating innovative ideas. This activity guides them to consider various ways to use AI to create a dynamic, creative classroom environment.

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