



TITLE: How do algorithms shape our world?

LEARNING SCENARIO

School:	Duration (minutes):	90
Teacher:	Students age:	10+

Essential Question:

What is the goal of a machine learning search algorithm?

Topics:

- artificial intelligence, machine learning, algorithmic thinking

Aims:

- get to know and understand the concept of machine learning and neural networks
- development of algorithmic thinking: understanding, analysing and problem solving
- developing the ability of searching for, collecting, organizing and using information from various sources
- developing elements of students' cooperation, exchange of ideas and experiences with the use of technology

Outcomes:

- the ability to test models related to image recognition
- developing algorithmic thinking

Work forms:

- individual work, work in pairs, group work

Methods:

- presentation, talk, interactive exercise

ARTICULATION

The course of action (duration, minutes)

INTRODUCTION

The purpose of this course is to understand machine learning algorithms.





ARTIE: Artificial Intelligence in Education - challenges and opportunities of the new era:
development of a new curriculum, guide for educators and online course for students
Project co-funded by European Union under Erasmus+ Programme, 2020-1-HR01-KA201-077800

An algorithm is a detailed, step-by-step process followed in order to accomplish a specific task or to solve a specific problem. We can define an algorithm by writing out the step-by-step instructions, thinking about things in terms of discrete steps. For example, our algorithm for a child's morning routine could be the following:

- Wake up and turn off the alarm
- Get dressed
- Brush teeth
- Eat breakfast
- Go to school

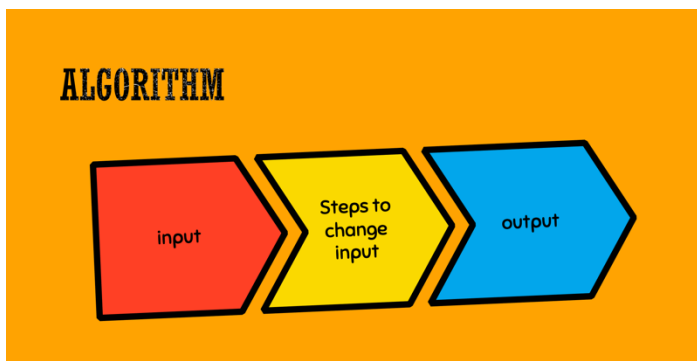
Announcement of the goal of the lesson:

Let's get acquainted with machine learning algorithms.

MAIN PART

What an algorithm is?
What are the three parts of an algorithm?

An algorithm needs some input data and follows specific steps or instructions to give us the desired output.



Computers use algorithms, but so do humans.

Algorithms are a lot like a recipe.

For example, if we were baking a cake, the algorithm would take in the following ingredients, such as flour, sugar, salt, eggs, etc.

We would mix the dry ingredients and then mix in the wet ingredients like eggs or milk.

We would pour into a cake pan, set the oven to 180, and put the cake pan in the oven.

Our output would be a cake!



The task for students:

Write your algorithms.

Write an “algorithm” (or recipe) for the best sandwich. Be sure to specify what your inputs are.

1. What input data (or ingredients!) do you need?
2. Write out the steps in your algorithm.
3. What is the output of your algorithm?

Students share and present their algorithms. They talk about what their algorithms have in common and how they are different.

Possible questions for discussion:

Did any of you include instructions to put away your ingredients after you used them?

Then you were optimizing for tidiness in your algorithm!

Did any of you cut your sandwich into fun shapes? Cut off the crust?

Then you were optimizing for playfulness or aesthetics!

Computer algorithms also optimize for various goals, but sometimes this can be hard to spot. What do you think the goal of Google’s search algorithm is?

Students might say “best” results. If so, we can ask them what word they would replace with best as they did earlier.

Students might also say “best results for me,” so we can prompt students to ask what they mean by that, or how Google might confirm that they’ve shown “the best results for me.”

We’re looking for answers that will likely get us to click on links, to get us to click on advertisers' links - things that show students understand the search results benefit Google first.

Interactive exercise:

Open up Google search under two different accounts (or one under an account that is logged in, and one in an incognito browser).

Search for some of the following items: pizza place, best movie, news.

What do you think, why are the results different?

Topics for discussion:

Students share and present their search results.

They talk about what their results have in common and how they are different.

Google’s algorithm determines how pages on the internet are displayed and ranked based on their relevance to your search. In less than a second, interrelated search algorithms process information extremely quickly, interpreting your query and returning personalized results.

Sites such as Amazon and Netflix base recommendations on collaborative filtering algorithms that look at other users with similar interests and tastes and subsequently deliver predictions for purchases and shows.



Mapping applications such as Google Maps need to calculate routes through cities, taking into account distance, traffic, and accidents. Tools such as Google Flights also consider routes through many airports while considering layovers, prices, and time.

Topics for discussion:

- In order for the player to win the game, what conditions have to be met?
- How can we keep track of the score in our game?
- How can we count the number of times each letter appears in a word?
- What are the steps we have to take to swap the smallest and largest numbers in a list of numbers?

Interactive exercise:

The teacher presents the ArtBot game. In ArtBot players of all ages learn the basics of AI. Players' quest is to find and retrieve stolen art objects. Players train their AI helper to recognise and locate the objects hidden in a maze of dungeons, and see how supervised and reinforcement learning work. Students play the ArtBot game: <http://learnml.eu/artbot.php>

Optional interactive exercise:

<http://learnml.eu/games.php>

Minecraft Learns ML is a short game showcasing how videogames can be used to teach core principles of the architecture of neural networks using imitation learning. In Minecraft Learns ML, players have the chance to familiarize themselves with creating a machine learning dataset and decide on the basic architecture of a neural network to solve a simple navigation problem on the fly.

Super Meat Bot is a video game for teaching the principles of reinforcement. In Super Meat Bot players have the chance to design levels with rewards and deterrents for an AI and train it to overcome more and more difficult navigation challenges.

CONCLUSION

From Google search to morning routines, algorithms are ubiquitous in our everyday life.

Methods

- presentation*
- talk/discussion*
- work on the text*
- graphic work*
- interactive exercise /simulation on the computer*

Work forms

- individual work*
- work in pairs*
- group work*
- frontal work*

Material

- <http://learnml.eu/games.php>
- Google search

Literature





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- <http://learnml.eu/games.php>
- [http://learnml.eu/docs/AI in Education.pdf](http://learnml.eu/docs/AI_in_Education.pdf)
- <https://junilearning.com/blog/guide/importance-of-algorithms-for-kids/>

PERSONAL OBSERVATIONS, COMMENTS AND NOTES

