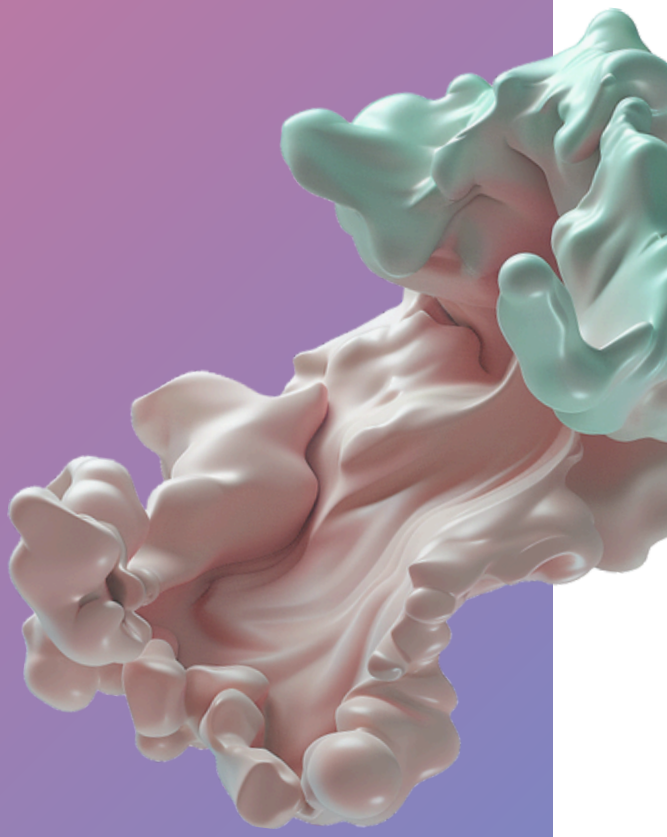
AI for Children

Artificial Intelligence Curriculum for Elementary and Secondary Schools

Social Studies IV

Emotion Recognition



kurikulum.aidetem.cz/en

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Proofreading: not yet done
Last update: 01/2025
Version: 05

These teaching materials were translated using ChatGPT.
Please note possible imperfections in the expressions or wording.

National Pedagogical Institute of the Czech Republic

We create methodologies in cooperation with the National Pedagogical Institute.

Form for comments

Emotion Recognition

A few words to begin

Dear teacher,

You are holding a Teaching material designed to support the teaching of artificial intelligence in elementary and secondary schools. This activity focuses on machine detection of emotions from human faces. We approach the topic mainly from the perspective of ethics, but of course the lesson also explains how these systems work. The methodology also includes an expanding activity of sentiment analysis from text. The lesson does not directly follow on from the previous one, but it is an important piece in the puzzle of understanding the contemporary world. Thank you for your desire, energy and courage to introduce students to the topic of artificial intelligence!

– AI for Children team

5 min
Basic orientation in the topic

In this teaching material, students will try out various tools that detect emotions in the face. MorphCast will be used to analyze them in images, ChatGPT (or another chatbot) in text, or the Free Sentiment Analyzer tool.

Lesson presentation in PDF

Editable presentation in Canva

Lesson Overview

Recommended Age, Lesson Length
Children aged 13-16 , 45–90 minutes.

Building Blocks
Emotion Recognition.

What are the Students Learning?
Artificial intelligence systems can detect emotions in text, images, videos, or voices with some accuracy.

Why Are They Learning This?
They think critically about the use of digital services and devices in everyday life.

How Do We Know They Have Learned It?
They will explain the principle of emotion recognition from human faces.
They will describe the ethical aspects associated with this technology.

Tools
Teacher: Projection equipment, presentation.
Students: Computers or tablets with a camera.

Digital Competence
Use and involvement.
Benefit and development.

Bloom's Taxonomy
Understanding: Students explain the principles of emotion recognition in text, images, and voice.
Applying: They use MorphCast to analyse emotions.
Analyzing: They evaluate the results of emotion recognition and discuss their accuracy and limitations.

Five Big Ideas
4-C-I Understanding Emotion.

Note: Gender equality is key for AI for children, but for brevity we use masculine formulations in our methodologies.

Glossary of terms

Artificial Intelligence (AI)
There is no universally accepted definition of artificial intelligence. However, all definitions agree that it refers to systems that simulate human thinking and behavior. Artificial intelligence typically takes the form of a computer program designed to solve tasks that once required significant human intellect and were considered the domain of people.
In addition, AI is also a scientific field that dates back to the first half of the 20th century. Its goal is not only to understand intelligent systems but above all to create them.

Machine Learning (ML)
Just like humans can learn from examples and experience, so can machines created by humans. Machines use a method called machine learning, which allows AI systems to go beyond executing preprogrammed actions and instead come up with new solutions on their own.
One of the key goals of machine learning methods is to discover patterns hidden in large datasets. Machine learning is a subfield of artificial intelligence.

Sentiment Analysis
Sentiment analysis is a process that enables AI systems to recognize and interpret emotions in text.
When analyzing text, the system looks at words and phrases to determine whether the sentiment is positive, negative, or neutral.
This technology is widely used – from monitoring brands and products on social media, through improving customer service, to developing interactive chatbots and digital assistants capable of more empathetic communication with users.

Facial Emotion Recognition
The process that allows artificial intelligence systems to analyze and interpret human emotions from facial expressions. It uses a combination of computer vision and machine learning to identify specific facial features, such as a smile, frown, raised eyebrows, etc., and based on these features, determine what emotion the person is expressing. For example, a system can recognize that if someone has raised corners of their mouth, they are likely laughing or happy. This technology finds applications in a variety of areas, from improving customer service to security applications to developing advanced interactive toys and robots that can better interact with people based on their emotional state.

Speech Emotion Recognition
The process by which an artificial intelligence system analyzes a human voice to identify the speaker's emotional state. This technology relies on analyzing various acoustic features of the voice, such as tone, volume, speed, and intonation, to reveal what emotions a person is experiencing. For example, the pitch and speed of speech can indicate excitement or stress, while a monotone voice can indicate sadness or fatigue.
Recognizing emotions in voice has wide applications. In customer service, it can help identify dissatisfied or frustrated customers so that their needs can be better addressed. In healthcare, it can help diagnose and monitor mental health based on changes in a patient's emotional expression. Recognizing emotions in the voice opens up new possibilities for creating more responsive and intuitive technological solutions.

Engage

10 min

Think & discuss

How do you know how you feel?
Possible answers: I perceive my emotions and physical manifestations based on interactions with other people...

Close your eyes for 5 seconds and try to notice your emotions, thoughts, and body. Become aware of how you feel right now.

What do you think helps people recognize how others are feeling?
Possible answers: From facial expression, attitude, gestures, from what they say and how they say it (intonation, strength of voice), from social interaction (for example, isolation from others can indicate sadness), from the context of the situation...

Description

Presentation slide 02

Take a look at the following synthetic (AI-generated) faces. Describe the emotions expressed by their facial expressions.

Synthetic images were generated by the Midjourney app (version 6).

Analyze

We tried to recognize emotions from synthetic faces. In some examples, it was not easy. Do you think people can always reliably recognize how others are feeling?
Possible answer: We are rarely able to recognize exactly how another person is feeling.

It's harder to know how someone is feeling when we only have a photo of them than when we're in the same room with them. In the room, we can see how they move, what gestures they make, and what's going on around them. What else can help us better understand the other person's emotions?
Possible answer: That we know them well.

Can we apply the same principles of emotion recognition to animals as to humans?
Possible answer: There are significant differences between humans and animals, and of course among animals in general.
Therefore, probably not, even though there are species that are closer to humans.

How does a cat or dog express emotions?
For example, dogs may happily wag their tails, while cats may express contentment by meowing or purring.

Do you think machines (computers, robots) can know how people feel?
Students will try it out in this lesson.

Understand

25 min

15 min

Activity 1

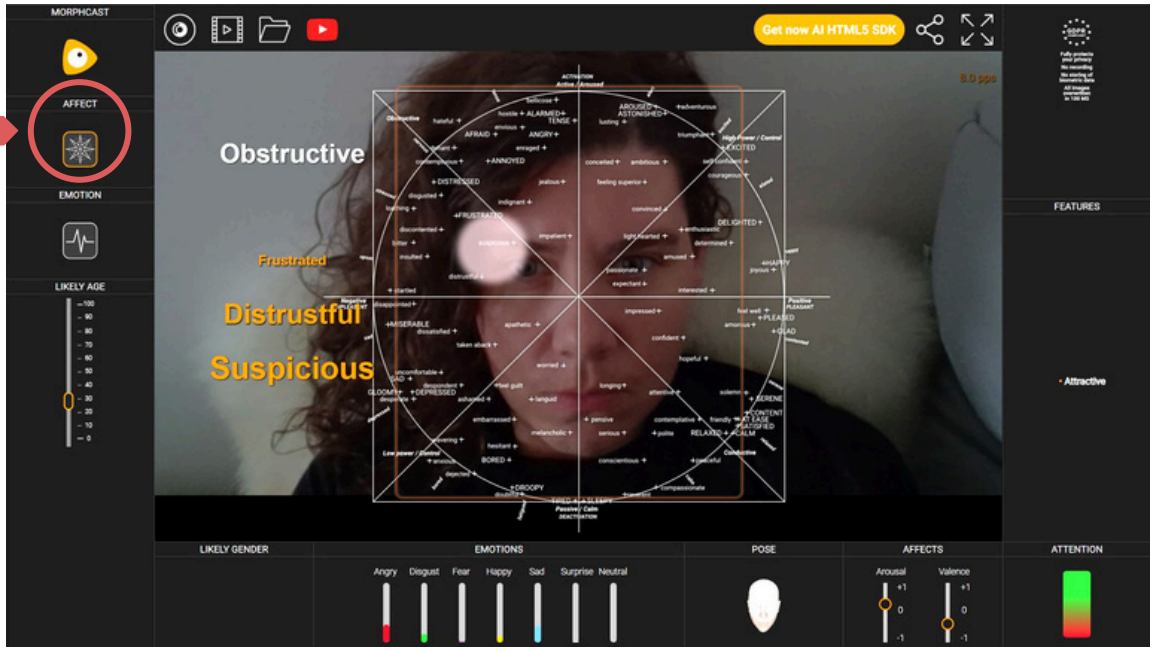
Presentation slide 03

Students will try emotion recognition from facial expressions (presentation slide 03).
They can work individually or in groups – depending on the camera equipment you have available.

MorphCast

Share the MorphCast tool address with them: bit.ly/morphcast
MorphCast is a free tool that doesn't require login. **Every 60 seconds, a pop-up asks for a license key, but refreshing the page with F5 lets you continue.** It complies with GDPR, and no user interaction data is stored. MorphCast detects emotions in facial expressions and also estimates age and gender. To work, it requires camera access in the browser.

Turn on Affect



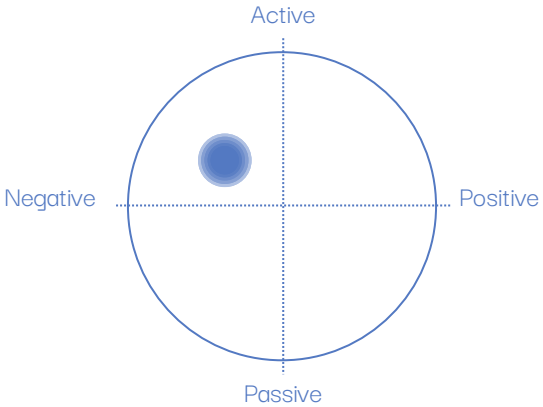
Suggestions for students:

Suggest to the students that they can try to alternate the expressions in such a way that they cover the entire spectrum of the circle. Where they are is indicated by a white blurred wheel that moves within the circle.

Ask how the application evaluated their neutral expression? Or whether it evaluated some expressions partially or completely incorrectly.

Do the keywords to the left of the circle match the emotion the students intended with their expression?

Students can also focus on detecting emotions in the bottom panel (scale).



Discuss with students.

We tested how emotion recognition works in MorphCast. How did it work for you? Did the app recognize your expressions with high accuracy?

There are more apps like MorphCast, some work worse and some work better. Do you think MorphCast would work for recognizing emotions in animals?
It won't work unless it was trained to recognize animals (i.e. the images the emotion recognition program was trained on didn't include animals along with a label of how they were feeling). Humans and animals are too different.

How is it possible that some apps can recognize emotions? How were they created?
These are systems that have "seen" a large amount of data in which they looked for similarities (patterns). Behind the MorphCast app interface is a so-called machine learning model that has been trained on a large number of human faces that have been labeled (annotated) by people. For example, many photos of faces with a cheerful expression that people have described as "cheerful expression", etc. If there is a lot of such data, the model that looks for similarities (patterns) in it can, based on this, determine expressions on faces that it has never seen before, because we humans have similar features. Usually, the more data the model has, the better it is able to classify new data.

What could we use machine recognition of facial emotions for?
This technology finds applications in various areas, from improving customer service to security applications to developing advanced interactive toys and robots that can better interact with people based on their emotional state.

Show the video to the students (not necessarily the whole thing).

Donald Trump speech (2017)

YouTube: www.youtube.com/watch?v=Gy_xTyHTxsU

The video contains footage from Donald Trump's 2017 speech to the United Nations General Assembly. In his speech, he focused on North Korea's reckless approach. The president spoke about the stance of the United Nations and allies on the missile crisis.

The system (from the now-defunct Emotion Research Lab) detects emotions in Donald Trump's face.

10 min

Affinity diagram

Write down the students' ideas on the board or flipchart and then mark similar ones by circling them in color. Then name the clusters and discuss them based on them.

We saw an example of machine emotion recognition in Donald Trump's speech in 2017. Do you have any questions about the moral or ethical dilemmas associated with this technology?
Privacy and tracking: Machine emotion recognition can be used to track people without their consent or knowledge. This raises questions about the right to privacy. Is it ethical to monitor people's emotional states without their knowledge?
Misuse of technology: There is a risk that this technology can be misused, for example in advertising or politics, to manipulate people's opinions and emotions. How should it be ensured that the technology is used in a way that respects ethical standards?
Misinterpretation: Systems can misinterpret emotional states. This can lead to to discrimination, for example if these were used to select candidates during a job interview.

Do you think the emotion recognition in the video always worked correctly?
Machine recognition of facial emotions does not always work correctly – on the contrary, these systems show consistent error rates. Various factors can affect accuracy:
These systems depend on the data they are trained on. If the data is limited or biased (for example, if it only contains faces from certain ethnic groups), it can affect the system's ability to correctly recognize emotions in the wider population.
Emotional expressions can vary depending on cultural and social context. Something that is considered an expression of joy in one culture may not be perceived the same way in another.
Emotions are not always unambiguous and can be expressed in different ways.
The accuracy of emotion recognition can also be affected by camera quality, lighting, etc.

Reflect

5 min
Think & share

Return to the lesson topic with the students.

How does technology recognize emotions in the face?
Possible answer: The machine learning model that allows MorphCast to recognize emotions in human faces has "seen" a large amount of data – specifically, human faces that have been labeled (annotated) by people and looked for similarities (patterns).

What factors can affect the accuracy of emotion recognition using MorphCast?
Several factors can affect the accuracy of emotion recognition using MorphCast:
Image quality: Poor lighting, low camera resolution, or a blurry image can cause problems with facial expression recognition.
Cultural differences: Different cultures may express the same emotions in different ways, which can affect recognition accuracy.
Insufficient data to train the model: If the model has not been trained on sufficiently diverse data (for example, faces from different ethnic groups), its ability to correctly recognize emotions may be limited.
Ambiguity of expressions: Emotions are not always unambiguous; some expressions can indicate multiple emotions at the same time or be difficult to interpret.
Individual differences: Each person expresses emotions a little differently.

10 min
If there's extra time

If you have time left, you can develop the lesson topic further.

Could we also recognize emotions in animals? And if so, how would we achieve this?
Possible answer: Recognizing emotions in animals is more difficult than in humans, as we cannot rely on verbal communication and must interpret physical signals and behavior. However, there are ways to detect and interpret emotional states in animals if we obtain enough data (sounds, images, etc.) that we can reliably describe.

Where do you think machine emotion recognition finds application?
Possible examples:
Customer Service: Emotion recognition can help chatbots and virtual assistants better understand users' emotional states and tailor their responses to be empathetic and more effective at solving problems.
Automotive: In the automotive industry, emotion recognition can be used to monitor the driver, detect fatigue or stress and warn the driver, or automatically adjust the car environment (e.g. lighting, music) to improve concentration and well-being.
Healthcare: In the healthcare field, emotion detection can be useful for patient monitoring with mental illnesses, pain assessment or for providing therapeutic support through virtual assistants.
Marketing and advertising: Analyzing emotional responses to advertising content or products can help businesses better understand what resonates with their target audiences and allow them to optimize their advertising strategies.
Interactive games and entertainment: In the gaming and entertainment industries, emotions can be used to adapt gameplay or story based on players' emotional reactions.
Social robotics: Social robots using emotion detection can offer more natural and empathetic interactions with humans.
Personalized recommendation systems: Emotion recognition can improve recommendation systems by taking into account the user's current emotional state when selecting content or products.

Do you perceive any ethical challenges or controversies associated with machine emotion recognition?
Possible examples:
The collection and analysis of emotional data can lead to privacy concerns if people are unaware that they are being monitored or do not consent to how their data is being used.
There is a risk that systems may be inaccurate or biased towards certain groups of people, which can lead to injustice or discrimination.
Emotion recognition technology could be used to manipulate people or improperly influence their decisions, for example in advertising or politics.

More to explore

30 min

30 min
Activity 2

Presentation slide 04

Students will divide into three groups and try out sentiment analysis in a text.

Their task is to first create three variants of the texts (each group one variant): positive, neutral and negative (on the topic you have specified).

Examples of text variants:

Positive option: Parental love and support work wonders. When children feel loved, they are stronger and braver. Parents who enjoy spending time with their children, listen to them, and support them create a great environment for their growth and happiness. This brings a lot of joy to everyone's lives.

Neutral option: The relationship between parents and children is like a cornerstone. Parents take care of more than just the basic needs of children. And children learn how to navigate the world. It is a process full of challenges but also successes that shapes who we are.

Negative option: Some parents really don't know how to treat their children. They don't give them love or attention, they are strict and disrespectful. This behavior can really affect children and lower their selfesteem. There are many parents like that.

Then have students evaluate these texts using a chatbot. For this purpose, choose one (or more) apps for text generation and analysis, such as ChatGPT, Microsoft Copilot or Google Gemini.

> **You always need to enter a prompt:**
> Perform a sentiment analysis of this text:
> [Text created by the students.]

There are other specialized sentiment analysis applications, such as Free Sentiment Analyzer. But the tools mentioned above are more than enough in our experience.