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Erasmus+



# Artificial intelligence

Material for students



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## Introduction

### Resolution

Development of artificial intelligence will cause numerous social and economic problems for people in the near future.

### Definitions

**The Turing machine** is an abstract machine that manipulates symbols. It is devised as a potentially infinite linear band in both directions which is divided into squares that are periodically inspected. The symbols in the squares are from the final alphabet. Machine instructions are sets of arranged fives ... In a practical sense, every computer is a Turing machine, although a Turing machine is not a specific device (computer).

**Phenomenal states** represent a characteristic qualitative trait of consciousness; they denote what it looks like to feel, perceive, want, etc.

A **neuron** is a nerve cell and the main component and functional unit of nerve tissue.

A **synapse** is any functional connection between two neurons.

**Deep learning** is a type of machine learning based on learning data representation.

A **cyber attack** is a type of attack that is directed towards information systems. Its goal is to disable computer equipment, unauthorized access to computer systems, data theft, etc.

**Ethical algorithm** would be a computer program which would define moral principles and rules of moral behavior for potentially intelligent machines.

### Introductory questions

In 1950, the pioneer of modern computing, Alan Turing, suggested a way to assess the intelligence of computers – known as the Turing test – which consisted of asking questions. The person who has the role of a judge communicates with a computer and a person simultaneously, asking them questions, while they give answers. If the judge in 70 percent of cases cannot differentiate between a person and a machine, it is considered that the machine has passed the Turing test.

**- Do you think machines can think?**

In Arthur Clarke's novel *2001: A Space Odyssey*, the perfect HAL-9000 computer, which passes the Turing test, when in a position to choose between achieving the goal of its mission, which it sees as its personal goal, and the life of the crew onboard the Discovery spacecraft, it decides to terminate the lives of crew members. It has no dilemma what to do, what is right from any ethical point of view, it simply does what contributes to the achievement of a certain goal.

**- Did HAL commit murder when it ended the lives of some crew members?**

In the science fiction novel by Philip K. Dick *Do Androids Dream of Electric Sheep*, Rick Deckard, a bounty hunter, armed with the Voight-Kampff test, roams the post-apocalyptic landscapes of San Francisco in search of six runaway androids Nexus-6. Although tormented by many doubts, Deckard is sure of one thing – no android has ever passed the Voight-Kampff test which measures empathy reactions. If you ask the respondent if he likes a suitcase made of human baby's skin, and his emotional reaction is absent or delayed, it is definitely an android. Simply put, the androids in this novel have no ability for empathy, which is one of the specific characteristics of humanity.

**- Do you think that in the near or distant future machines will be able to feel the same as people – happiness, sadness, fear, surprise, anger, disgust?**

**- Will they be able to sympathize and love?**

## Worksheet

Topic
Algorithms
Resolution
Development of artificial intelligence will cause numerous social and economic problems for people in the near future.

### Task 1.

The "Introduction" tab provided by the teacher contains a set of questions to help prepare arguments for the debate. On their basis, prepare a set of arguments and group them into those that are clearly PRO the resolution, AGAINST the resolution and those arguments that can be used by both sides. Enter them in the appropriate places in the table.

PRO	DEBATABLE	CON
<ol style="list-style-type: none"> <li>1. There are ways to create artificial intelligence at the human level, and also artificial intelligence that is above human.</li> <li>2. Machines (artificial intelligence) can perform many activities and jobs better than people.</li> <li>3. Machines can, or will in the future, create works of art just as well or better than humans.</li> <li>4. Intelligent machines pose a risk to the safety of humans.</li> </ol>		<ol style="list-style-type: none"> <li>1. Although there are no essential theoretical obstacles to the creation of artificial intelligence at the human level, as well as superintelligence, such a stream of events still belongs to distant future.</li> <li>2. Machines (artificial intelligence) have numerous difficulties doing jobs that people do with ease.</li> <li>3. Machines (for now) have no consciousness, and the creative imagination dependent on it, so they cannot create works of art.</li> <li>4. Artificial intelligence is not a threat in itself.</li> </ol>

## FACTS FOR PROPER ARGUMENTATION

Below you will find Info cards, Story cards and Question cards. Read them carefully and analyse in order to formulate good arguments for the debate.

Info card 1 Facts and data	Info card 2 Facts and data	Info card 3 Facts and data	Info card 4 Facts and data
<p><b>There are ways to create artificial intelligence at the human level, and also artificial intelligence that is above human.</b></p> <p>Human knowledge, when it comes to information and communication technologies at least, is said to be growing exponentially. Also, the number of transistors on integrated circuits doubles every two years. This is known as Moore's Law. Based on the testimony of AI experts, Nick Bostrom predicts that the chances of human-level machine intelligence (AI which passes the Turing test) are 10 percent by 2030, 50 percent by 2050, and 90 percent by 2100. According to this prediction, we should have machine intelligence at the human level by the end of the millennium, after which there would be a rapid development of artificial intelligence in two to 30 years, to get superintelligence - artificial intelligence that far surpasses human. According to Bostrom, one of the ways to reach human-level AI is the emulation of the whole brain. He suggests a procedure by which the whole human brain, neuron by neuron, is emulated as a computer device, and then to study in detail each (functional) connection between neurons (synapses). While the</p>	<p><b>Machines (artificial intelligence) can perform many activities and jobs better than people.</b></p> <p>In 1997, a computer called <i>Deep Blue</i> defeated world chess champion Gary Kasparov. Kasparov later claimed to have seen traces of true intelligence and creativity in some of the moves made by the computer. Over the past twenty or more years, computers have improved and have outperformed humans in numerous games. For example, in 2010 <i>IBM Watson</i> defeated the two greatest human champions in the <i>Jeopardy!</i> quiz in which general questions are asked in the form of clues and puns. AI methods are used today in numerous areas. Autopilots have been in use for a while, and today we have cars that use artificial intelligence instead of a human driver. Oxford University philosopher Luciano Floridi jokingly observes that if a plane bumps on landing, we should probably blame the pilot. A good medical diagnosis of breast cancer, for example, is almost unthinkable without the use of a computer. Computers suggest a treatment plan and can interpret the electrocardiogram. Robots help people with dementia and children with autism.</p>	<p><b>Machines can, or will in the future, create works of art just as well or better than humans.</b></p> <p>While many worry that intelligent robots will take over human jobs (as many in the 18th century worried that the Industrial Revolution would bring great misfortune including job loss), it is possible that intelligent machines, maybe more intelligent than humans, will become more dominant in the production of works of art. Artistic imagination is usually considered exclusively a human trait, and the production of works of art is considered exclusively a human activity. Such a future may be closer than we can assume. In 2016, a computer program co-authored the novel "Day" when a computer wrote a novel that was shortlisted for a literary prize in a competition in which other authors were people. In the spring of the same year, the New Rembrandt appeared - a portrait of a middle-aged man created entirely by artificial intelligence. The complex process of creating a new "Rembrandt" work involved computer analysis of 346 paintings by this great artist, the use of deep learning algorithms, and the reproduction of textures and brush</p>	<p><b>Intelligent machines pose a risk to the safety of humans.</b></p> <p>Artificial intelligence can be used maliciously or become malicious in the near or distant future. For this reason, we need to see how we can predict, prevent or mitigate the detrimental effects that the radical development of AI can lead to. Significant loss of the right to privacy is just one of the topics we are faced with on a daily basis. Information systems use a huge amount of electricity and pollute the environment... The development of artificial intelligence has led to changes in society and politics, to a different distribution of power, because the state is no longer the only institution possessing a large amount of data (information) that can be used for control and manipulation, they are also possessed by corporations and smaller informal groups. Advances in technology are changing the rules of war. In the modern world, cyber attacks are a common occurrence. For example, the computer virus <i>Stuxnet</i>, allegedly developed by some of the governments (the USA and Israel are mentioned), has caused enormous damage to the Iranian nuclear program. The development of</p>

<p>simulation mimics the results, the emulation mimics the internal causal dynamics, and the emulation is successful if the emulated system produces the behavior and results as the original. If brain activity is seen as a function physically realized by the brain, then it will be possible to realize the process on a Turing machine. Although such technology does not yet exist, we cannot rule out the possibility that it will exist in the near future and that we will then be able to emulate human brains to specific devices. Brain emulation is software complemented by hardware that models the states and functional dynamics of the brain. Mind emulation would represent brain emulation with phenomenal states.</p>	<p>Artificial intelligence helps the police classify offenders based on a large number of variables and decide on keeping them in custody. Unmanned aerial vehicles are used in military operations, and robots are trained to dismantle bombs. Nick Bostrom says Apple's <i>Siri</i> responds (if imperfectly) to simple queries and executes commands, and that optical recognition of written or typed text is largely used for sorting shipments and digitization of old documents. He also points out that today AI is used for face recognition at border crossings, solving complex mathematical problems. AI is used in economics, the securities market and trade in general... Bostrom points out that all systems currently in use are narrowly specialized, but have the capacity that can be used to develop general artificial intelligence: classifiers, search algorithms, planners, solvers and frameworks of representation.</p>	<p>strokes required an analysis of more than 165,000 fragments of Rembrandt's original works. Finally, the image was printed using a 3D printer. The result amazed many, and the endeavor received huge media attention and brought numerous awards to the participants. In addition, it has long been speculated that a sufficiently powerful computer equipped with an adequate software algorithm, a simple combination and permutation of the letters of the alphabet and punctuation marks at one point would produce, if not all, then at least some of Shakespeare's works, which are considered top works of world literature. In 2018, with the help of a deep learning program trained on about 2600 real sonnets, researchers succeeded, more or less successfully, to produce a sonnet similar to the one written by man.</p>	<p>artificial intelligence can pose a threat to people's physical security. From 2002 to 2012, CIA-operated drones killed more than 2,400 people in Pakistan, including 479 civilians. The development of autonomous weapons (killer robots) can also pose a significant threat. In the future, attacks on hospital and airport information systems, civilian and military, could be detrimental and take many lives. <i>Deepfake</i> technology, which relies on machine learning to generate photorealistic but false images of the human face, can be used to discredit people, deceive and produce fake news. If Nick Bostrom is right and if we are really on a road to create artificial intelligence that will surpass human intelligence in all relevant aspects, then the future that awaits us is uncertain, if not sinister. One of the ways to deal with this problem is to make the future machines with built-in ethical algorithms, so that they would not pose a threat to human safety.</p>
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Info card 5 Facts and data	Info card 6 Facts and data	Info card 7 Facts and data	Info card 8 Facts and data
<p><b>Although there are no essential theoretical obstacles to the creation of artificial intelligence at the human level, as well as superintelligence, such a stream of events still belongs to distant future.</b></p> <p>The growth of human knowledge is not exponential, but follows a sigmoid curve, which is almost in the shape of the Latin letter "S". This is clearer if we compare the growth of knowledge and technological progress with physical growth. An average human being grows at a certain pace, the growth is not too obvious at first, then it speeds up during puberty, only to stop when it reaches a certain plateau. Rarely anyone grows more than two meters in height. The same stands for the number of transistors on an integrated circuit. Although for now the number of transistors doubles every two years, because the size of the transistors is decreasing, such a trend cannot continue indefinitely, because there is an upper limit of physical divisibility. When it comes to forecasts, Alan Turing predicted that machines would be able to pass the Turing test successfully by 2000, exactly 50 years since the prediction was made. Of course, that year, computers weren't even close to passing the Turing test. In 2013, Eric Schmidt from Google stated that computers could pass the Turing test in the next five years, by 2018. Today, we are on</p>	<p><b>Machines (artificial intelligence) have numerous difficulties doing jobs that people do with ease.</b></p> <p>Anyone with average intelligence can see that a wooden chessboard can be used as firewood (when lacking a better one), and not just for playing chess. It is possible that robots "know" how to pack books in a box better than humans, but the same robots do not know how to use a book to kill a cockroach. In more general terms, robots cannot recognize that an object with a specific function can be used in contexts outside those for which it is intended. For example, the function of a hammer is to drive nails, but it can also be used as a door stopper. Also, although they can execute complex tasks better than humans, robots have enormous difficulties when it comes to performing simple tasks that humans perform routinely.</p> <p>The term "Moravec's paradox" means that things that are easy for humans to do are difficult for robots, and vice versa. "Robots can even go to Mars, but they can't fetch groceries," vividly explains Fumiya Iida from the Cambridge University Engineering Department. For years, his team has been working with various companies and trying to solve the problems of their robots, which are called the <i>last meter problem</i>. For the past two years, Iida has been working with G's Growers, a company that</p>	<p><b>Machines (for now) have no consciousness, and the creative imagination dependent on it, so they cannot create works of art.</b></p> <p>By carefully reading newspaper articles that convey the great enthusiasm of experts for artificial intelligence, it is notable that both the novel and the sonnet, as well as a picture, are actually the work of humans, and not some kind of autonomous artificial intelligence. As for a novel or a sonnet, it should be noted that experts were the ones who chose the words, sentences and set the parameters for the construction, before letting AI do the rest of the work. Similarly, it was humans who provided the deep learning program with fragments of Rembrandt's works. When it comes to the New Rembrandt, Jonathan Jones, an art critic of the British Guardian, wrote "What a horrible, tasteless, insensitive and soulless travesty of all that is creative in human nature. What a vile product of our strange time when the best brains dedicate themselves to the stupidest "challenges", when technology is used for things it should never be used for and everybody feels obliged to applaud the heartless results because we so revere everything digital", Jones wrote at the time. Similar skepticism is expressed when it comes to other works of AI. Leaving aside artistic</p>	<p><b>Artificial intelligence is not a threat in itself.</b></p> <p>Technology without risk does not exist. Technology that poses no threat has not yet been created. Simple home appliances can pose a threat to the safety of their users. A washing machine is nothing but a robot with low artificial intelligence in a huge tin box. When it breaks down, it can cause flooding in the apartment. Concerns associated with the advancement of AI are somewhat justified, but they are more often exaggerated. There is a lot of confusion when it comes to the threats posed by artificial intelligence. Firstly, the question is whether artificial intelligence in itself poses a threat. Do autonomous machines pose a risk to society? Secondly, the question of threat refers to the reckless use of artificial intelligence for the deception, manipulation or something even more sinister. The media and some futurists commonly present the development of artificial intelligence the way it is presented in Hollywood science fiction blockbusters: independent machines, with intelligence equal to or above human-level, take matters into their own hands and deal with humans. This would mean that artificial intelligence would at one point spiral out of control, and when that happens, humanity is doomed, since that machines would take</p>

<p>the verge of 2020, and no computer is even close to passing the Turing test, and in 100 years, probably none of us will be around to testify that the predictions were wrong. When it comes to emulation, one of the obstacles to emulating the human brain may be the following - the human brain is made up of about 100 billion neurons. Each of these neurons can potentially make about 10,000 functional connections (synapses) with other neurons. Scientists have calculated that the number of possible combinations and permutations in making connections exceeds the number of elementary particles in the known universe. Bostrom himself admits that we are not even close to emulating a cylindrical worm nervous system that has only 320 neurons, whose functions are well studied and known. Whether it is possible to create consciousness (and human-level intelligence) in non-biological material is an open question (although there may be no fundamental obstacles to doing so). The problem is that we don't even know how the brain does it.</p>	<p>produces fruits and vegetables, and working on designing robots that are able to pick lettuce without crushing it. Iida has also worked with the British national airline <i>British Airways</i>, whose robots had a problem placing luggage on a plane. A more interesting example of Moravec's paradox is the inability or incompetence of a robot for any kind of emotional intelligence. While humans can read and respond to physical queues sent by other people and act accordingly, robots find this a huge challenge. The behavior of machines at the current level of development of science and technology is rigid and limited by program algorithms and purpose - a robot that packs books cannot cook or iron clothes, no matter how intelligent it may seem, nor can a computer that plays chess better than the best chess player.</p>	<p>criticism, in all three cases the input always depends on people and their intelligence, i.e. people are always the ones who provide computers with adequate and carefully selected information. If the information were random and not carefully selected, the results would probably have been devastating. The process of deep learning is possible only because a huge amount of information (sometimes voluntarily, sometimes involuntarily, through the violation of privacy principles) is provided by humans. Machines, regardless of how autonomous they seem, cannot do it on their own. Finally, if machines are not conscious - and they are not - and there is no sign that they will be in the near future, then there is nothing that depends on consciousness in the strict sense of the word, such as knowledge, daydreaming and creative imagination, and there is no art produced by AI.</p>	<p>over primacy and dominance. This scenario is more like science fiction than a real course of events. The real risks and threats are related to the "malicious use of AI technology", which means that the real threat is not posed by intelligent machines, because machines are not intelligent in any relevant psychological sense and the question is whether they will be any time soon, but by people who use "intelligent" machines.</p>
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Stories	Stories
<p>Glistening-footed Thetis reached Hephaestus' house, indestructible, bright as stars, shining among the gods, built of bronze by the crippled Smith with his own hands. There she found him, sweating, wheeling round his bellows, pressing the work on twenty three-legged cauldrons, an array to ring the walls inside his mansion. He'd bolted golden wheels to the legs of each so all on their own speed, at a nod from him, they could roll to halls where the gods convene then roll right home again—a marvel to behold. <b>Homer, <i>The Iliad</i>, Book XVIII</b></p> <p>The idea behind digital computers may be explained by saying that these machines are intended to carry out any operations which could be done by a human computer. ... We may hope that machines will eventually compete with men in all purely intellectual fields. <b>Alan Turing, <i>Computing Machinery And Intelligence</i></b></p> <p>Prove you are not a robot. Our systems have detected unusual traffic from your computer network. This page checks to see if it's really you sending the requests, and not a robot. <b>Google</b></p>	<p>If machine brains one day come to surpass human brains in general intelligence, then this new superintelligence could become very powerful. As the fate of the gorillas now depends more on us humans than on the gorillas themselves, so the fate of our species then would come to depend on the actions of the machine superintelligence. <b>Nick Bostrom, <i>Superintelligence: paths, dangers, strategies</i></b></p> <p>AI research seeks both to reproduce the outcome of our intelligent behaviour and to produce the equivalent of our intelligence. As a branch of engineering interested in reproducing intelligent behaviour, reproductive AI has been astoundingly successful. ... However, as a branch of cognitive science interested in producing intelligence, productive AI has been a dismal disappointment. It does not merely underperform with respect to human intelligence; it has not joined the competition yet. Current machines have the intelligence of a toaster and we really do not have much of a clue about how to move from there. <b>Luciano Floridi, <i>The 4th Revolution</i></b></p> <p>If we ask, "How much real, observer-independent intelligence do computers have, whether 'intelligent' or 'superintelligent'?" the answer is zero, absolutely nothing. ... Commercial computers are complicated electronic circuits that we have designed for certain jobs. And while some of them do their jobs superbly, do not for a moment think that there is any psychological reality to them. Why is it so important that the system be capable of consciousness? Why isn't appropriate behavior enough? Of course for many purposes it is enough. If the computer can fly airplanes, drive cars, and win at chess, who cares if it is totally nonconscious? But if we are worried about a maliciously motivated superintelligence destroying us, then it is important that the malicious motivation should be real. Without consciousness, there is no possibility of its being real. <b>John Searle, <i>What Your Computer Can't Know</i></b></p>

Issue card 1 Questions	Issue card 2 Questions	Issue card 3 Questions	Issue card 4 Questions
<p><b>Question:</b> If we don't know how the brain produces consciousness and intelligence, how can we make artificial brains that do it?</p>	<p><b>Question:</b> Do computers know that they are better than humans in many games and jobs?</p>	<p><b>Question:</b> While I write using <i>Microsoft Word</i>, I make a great number of typing mistakes which it corrects. Does <i>Microsoft Word</i> take part in the writing of my text?</p>	<p><b>Question:</b> If intelligent machines pose a threat to human safety and jeopardize their privacy, why wouldn't we simply stop working on their development and production?</p>
Issue card 5 Questions	Issue card 6 Questions	Issue card 7 Questions	Issue card 8 Questions
<p><b>Question:</b> Perhaps today we don't have human-level or above human level artificial intelligence, but we will in the future.</p>	<p><b>Question:</b> If six million years of biological and cultural evolution haven't made people moral agents, why should we expect machines to surpass human morality?</p>	<p><b>Question:</b> Which moral theories would be implemented if we know that there are numerous theories which are often contradicted, e.g. utilitarianism and deontology?</p>	<p><b>Question:</b> Who will be held responsible if an autonomous machine causes an accident?</p>

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Prepare arguments for the discussion. One group of students prepares arguments supporting the resolution, the other one has contradictory arguments. Use the proposed scheme.

#### ARGUMENT NO.1.

Argument	Foreseen rebuttals of the other group	Answers to rebuttals

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## ARGUMENT 2.

Argument	Foreseen rebuttals of the other group	Answers to rebuttals
		

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### ARGUMENT 3.

Argument	Foreseen rebuttals of the other group	Answers to rebuttals
		



Debate

**Development of artificial intelligence will  
cause numerous social and economic  
problems for people in the near future.**

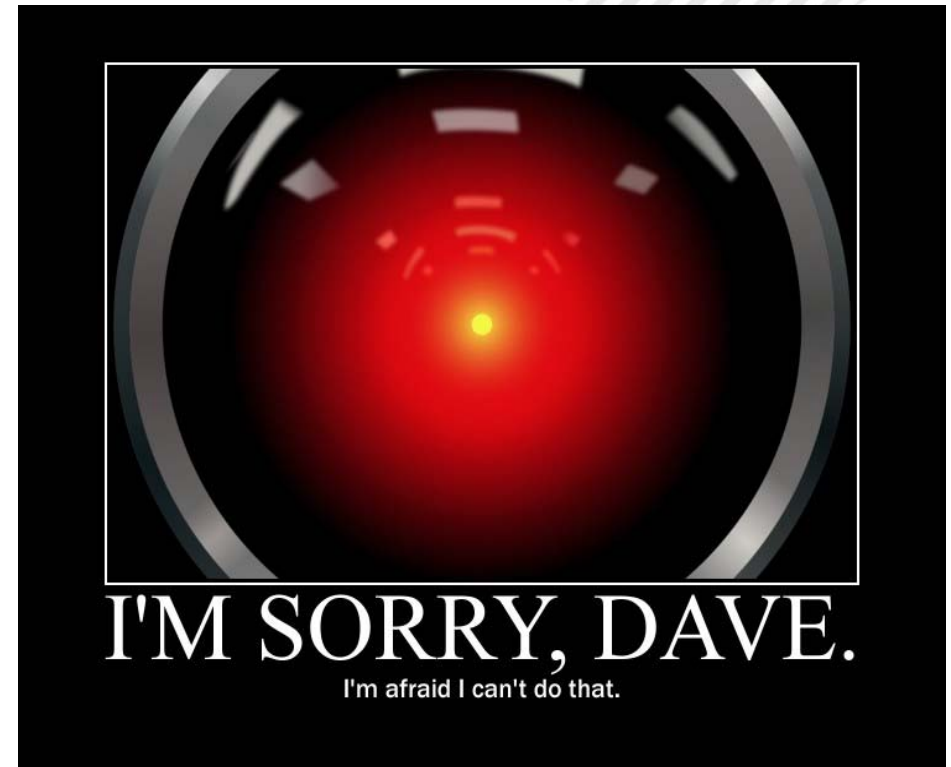
Topic: Algorithms

## Basic terms

- **The Turing machine** is an abstract machine that manipulates symbols. It is devised as a potentially infinite linear band in both directions which is divided into squares that are periodically inspected. The symbols in the squares are from the final alphabet. Machine instructions are sets of arranged fives ... In a practical sense, every computer is a Turing machine, although a Turing machine is not a specific device (computer).
- **Phenomenal states** represent a characteristic qualitative trait of consciousness; they denote what it looks like to feel, perceive, want, etc.
- A **neuron** is a nerve cell and the main component and functional unit of nerve tissue.
- A **synapse** is any functional connection between two neurons.
- **Deep learning** is a type of machine learning based on learning data representation.
- A **cyber attack** is a type of attack that is directed towards information systems. Its goal is to disable computer equipment, unauthorized access to computer systems, data theft, etc.
- **Ethical algorithm** would be a computer program which would define moral principles and rules of moral behavior for potentially intelligent machines

## Introductory questions

- Do you think machines can think?
- Did HAL commit murder when it ended the lives of some crew members?
- Do you think that in the near or distant future machines will be able to feel the same as people – happiness, sadness, fear, surprise, anger, disgust?
- Will they be able to sympathize and love?



*Извор: Wikimedia Commons*

RESOLUTION: Development of artificial intelligence will cause numerous social and economic problems for people in the near future.



*Source: Piqsels*

## PRO

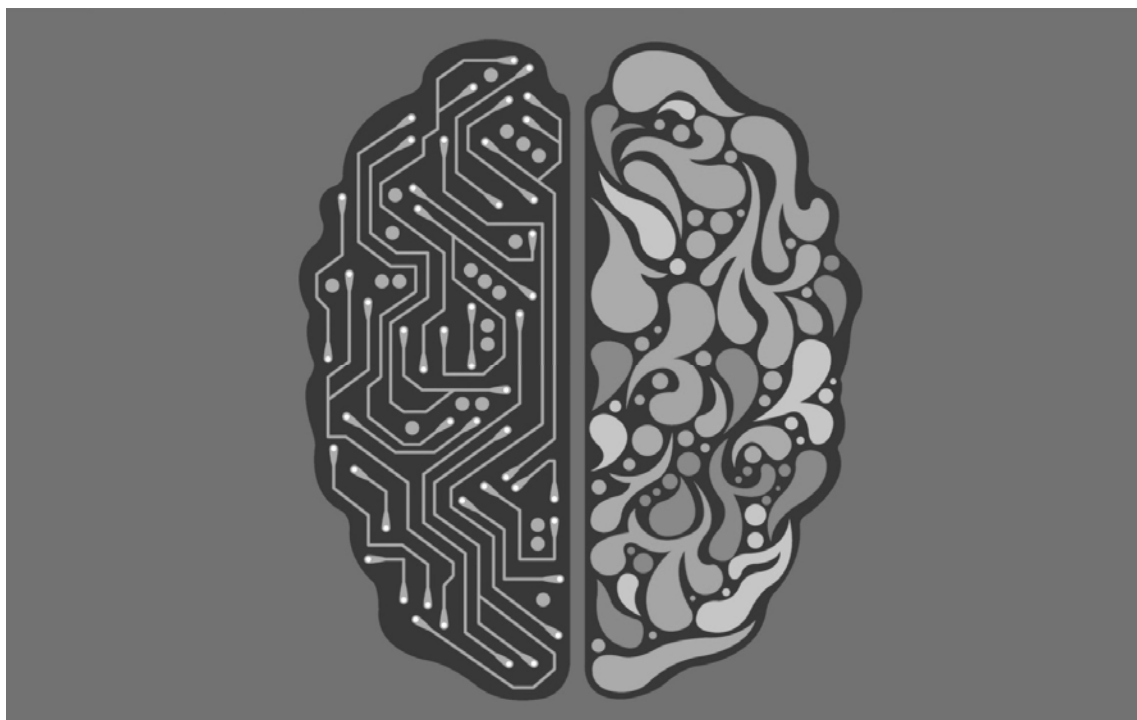
1. There are ways to create artificial intelligence at the human level, and also artificial intelligence that is above human.
2. Machines (artificial intelligence) can perform many activities and jobs better than people.
3. Machines can, or will in the future, create works of art just as well or better than humans.
4. Intelligent machines pose a risk to the safety of humans.

## CON

1. Although there are no essential theoretical obstacles to the creation of artificial intelligence at the human level, as well as superintelligence, such a stream of events still belongs to distant future.
2. Machines (artificial intelligence) have numerous difficulties doing jobs that people do with ease.
3. Machines (for now) have no consciousness, and the creative imagination dependent on it, so they cannot create works of art.
4. Artificial intelligence is not a threat in itself.



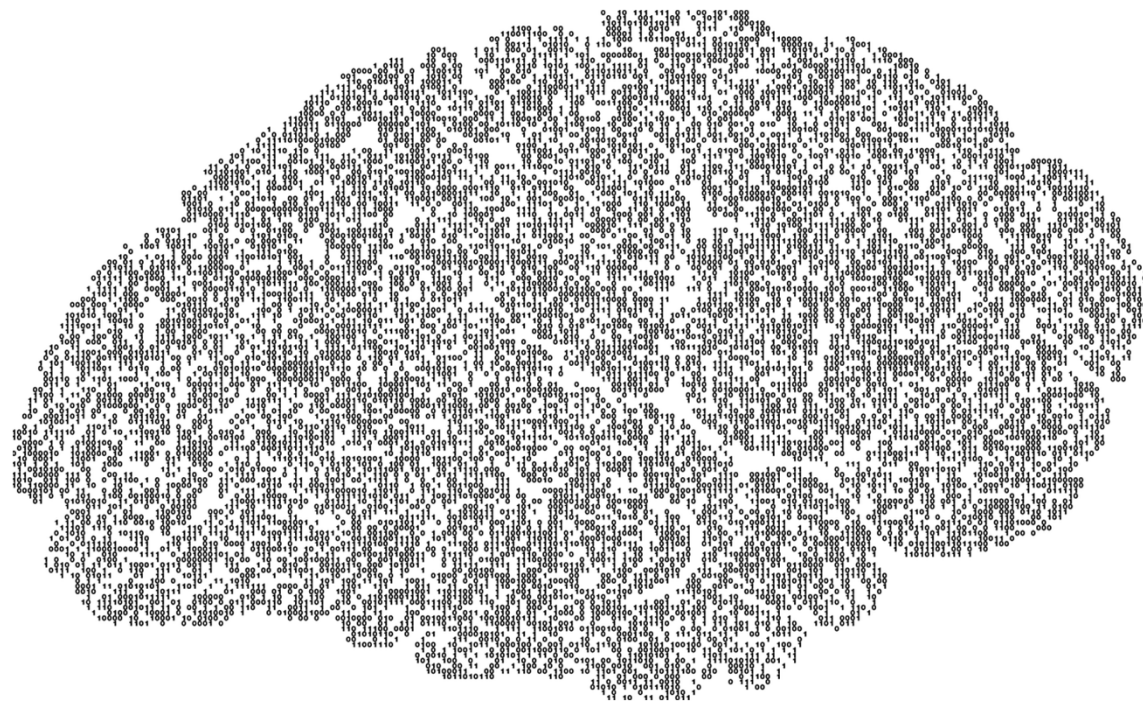
1. There are ways to create artificial intelligence at the human level, and also artificial intelligence that is above human. (PRO)



*Source: Pixabay*

- Human knowledge, when it comes to information and communication technologies at least, is said to be growing exponentially. .
- Nick Bostrom thinks that we should have machine intelligence at the human level by the end of the millennium, after which there would be a development of intelligence that far surpasses human.
- One of the ways to reach human-level AI is the emulation of the whole brain.
- Brain emulation is software complemented by hardware that models the states and functional dynamics of the brain.

1. Although there are no essential theoretical obstacles to the creation of artificial intelligence at the human level, as well as superintelligence, such a stream of events still belongs to distant future. (CON)

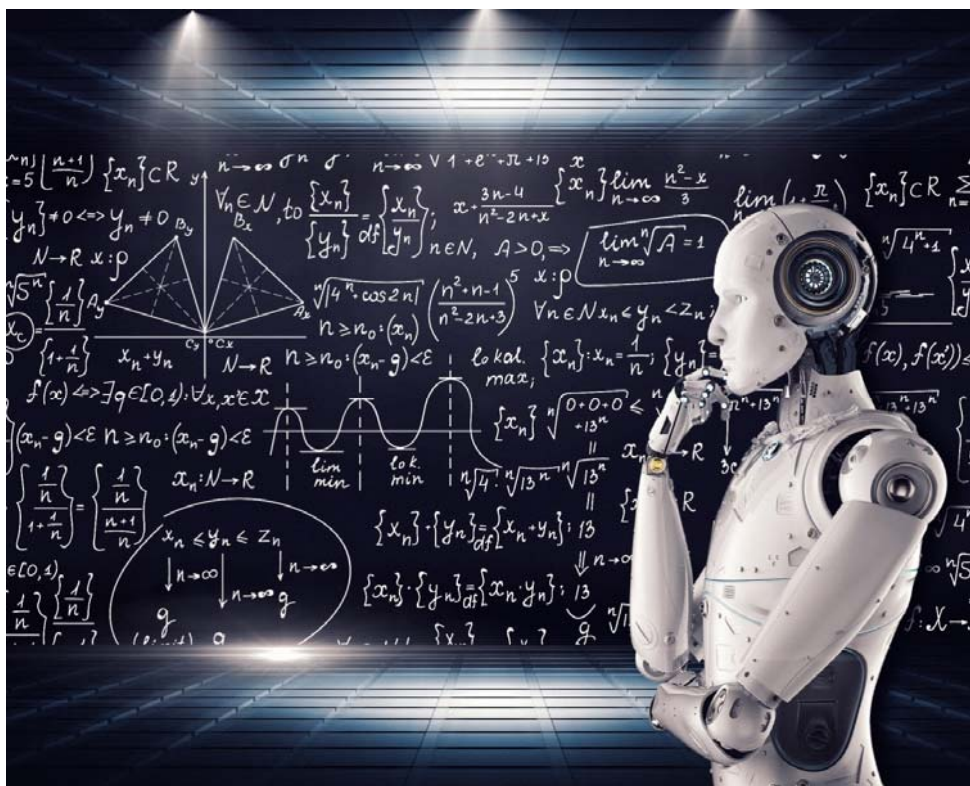


*Source: Needpix*

- The growth of human knowledge is not exponential, but follows a sigmoid curve, which is almost in the shape of the Latin letter "S".
- Although for now the number of transistors doubles every two years, because the size of the transistors is decreasing, such a trend cannot continue indefinitely, because there is an upper limit of physical divisibility.
- Bostrom himself admits that we are not even close to emulating a cylindrical worm nervous system that has only 320 neurons, whose functions are well studied and known, let alone human brain which has around 100 billion neurons.
- Whether it is possible to create consciousness (and human-level intelligence) in non-biological material is an open question.
- The problem is that we don't even know how the brain does it.



## 2. Machines (artificial intelligence) can perform many activities and jobs better than people. (PRO)

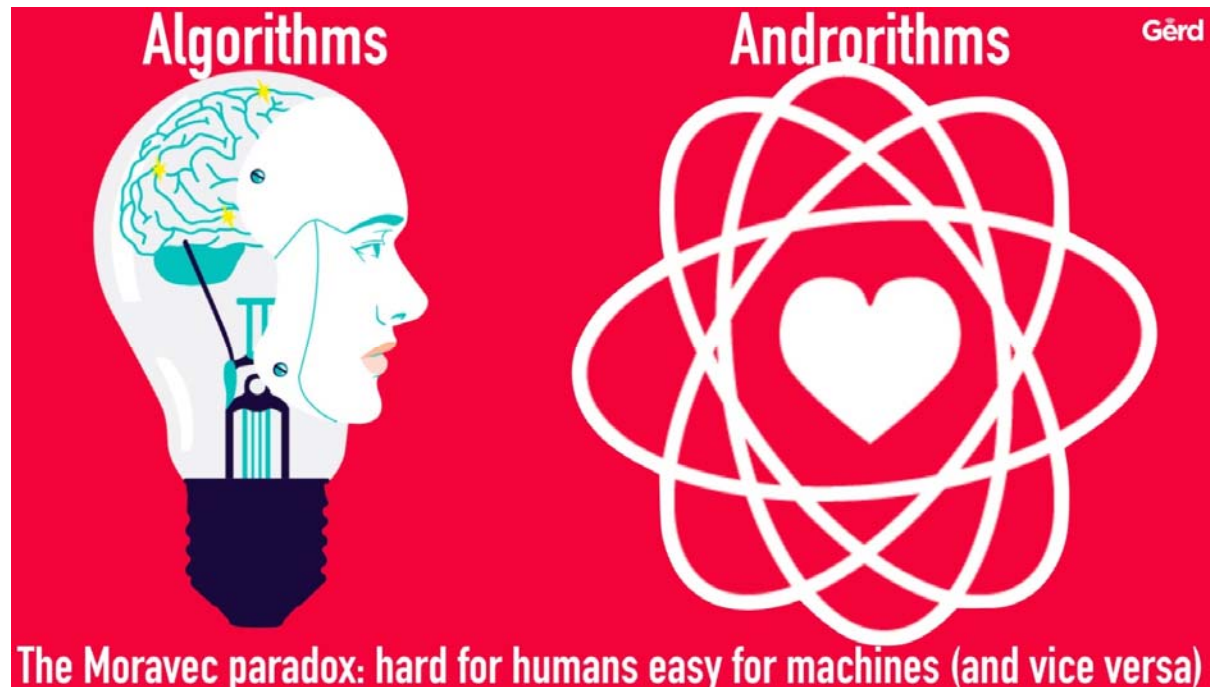


Source: Flickr



- In 1997, when a computer called Deep Blue defeated world chess champion Gary Kasparov, he claimed to have seen traces of true intelligence and creativity in some of the moves made by the computer.
- Autopilots have been in use for a while, and today we have cars that use artificial intelligence instead of a human driver.
- Artificial intelligence is used in medical diagnostics, military operations, in economics and for solving complex mathematical tasks, as well as face recognition on border crossings.

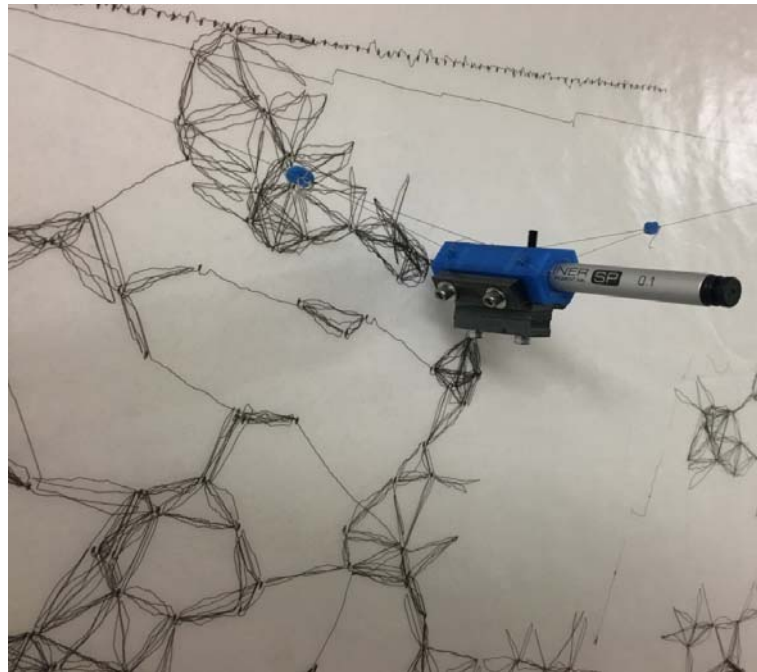
2. Machines (artificial intelligence) have numerous difficulties doing jobs that people do with ease. (CON)



Source: Flickr

- The term "Moravec's paradox" means that things that are easy for humans to do are difficult for robots, and vice versa.
- 
- The behavior of machines at the current level of development of science and technology is rigid and limited by program algorithms and purpose - a robot that packs books cannot cook or iron clothes, no matter how intelligent it may seem, nor can a computer that plays chess better than the best chess player.

3. Machines can, or will in the future, create works of art just as well or better than humans.  
(PRO)

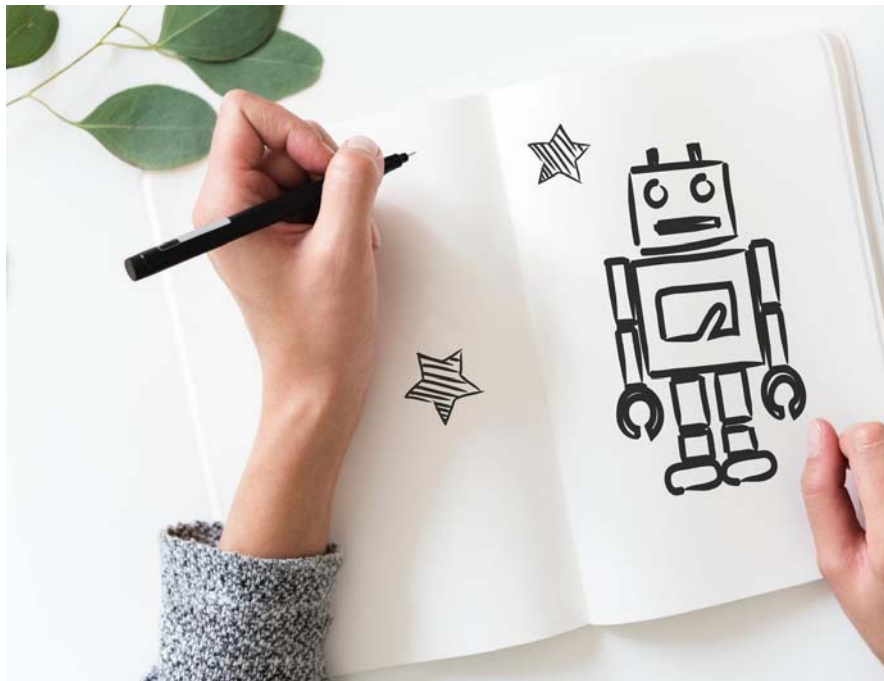


*Source: Flickr*

- While many worry that intelligent robots will take over human jobs, it is possible that intelligent machines, maybe more intelligent than humans, will become more dominant in the production of works of art.
- In 2016, a computer program co-authored the novel "Day" when a computer wrote a novel that was shortlisted for a literary prize in a competition in which other authors were people.
- In the same year, a New Rembrandt appeared (<https://www.youtube.com/watch?v=luygOYZ1Ngo>) – a portrait of a middle-aged man created entirely by artificial intelligence.



3. Machines (for now) have no consciousness, and the creative imagination dependent on it, so they cannot create works of art. (CON)



*Source: Pxhere*

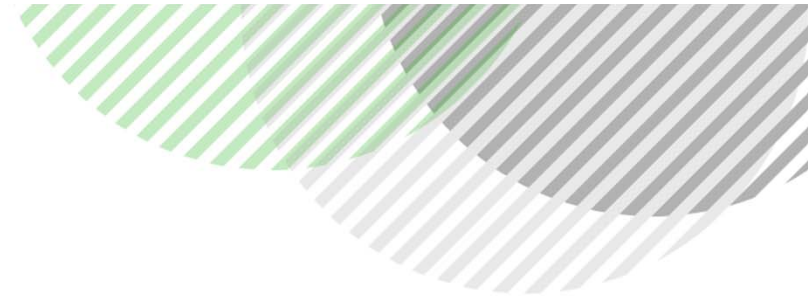
- By carefully reading newspaper articles that convey the great enthusiasm of experts for artificial intelligence, it is notable that both the novel, as well as a picture, are actually the work of humans, and not some kind of autonomous artificial intelligence
- The process of deep learning is possible only because a huge amount of information is provided by humans.
- Machines, regardless of how autonomous they seem, cannot do it on their own.
- If machines are not conscious, then there is nothing that depends on consciousness in the strict sense of the word, such as knowledge, daydreaming and creative imagination, and there is no art produced by AI.

#### 4. Intelligent machines pose a risk to the safety of humans. (PRO)



*Source: Flickr*

- Artificial intelligence can be used maliciously or become malicious in the near or distant future.
- Significant loss of the right to privacy is just one of the topics we are faced with on a daily basis
- Information systems use a huge amount of electricity and pollute the environment.
- Advances in technology are changing the rules of war.
- From 2002 to 2012, CIA-operated drones killed more than 2,400 people in Pakistan, including 479 civilians.



#### 4. Artificial intelligence is not a threat in itself. (CON)



*Source: Piqsels*



- Technology that poses no threat has not yet been created.
- A washing machine is nothing but a robot with low artificial intelligence in a huge tin box, and when it breaks down, it can cause flooding in the apartment
- Concerns associated with the advancement of AI are somewhat justified, but they are more often exaggerated, especially by the media and some futurists.
- The real risks and threats are related to the "malicious use of AI technology", which means that the real threat is not posed by intelligent machines, but by people who use "intelligent" machines.

## STORY (1)

Glistening-footed Thetis reached Hephaestus' house,  
indestructible, bright as stars, shining among the gods,  
built of bronze by the crippled Smith with his own hands.  
There she found him, sweating, wheeling round his bellows,  
pressing the work on twenty three-legged cauldrons,  
an array to ring the walls inside his mansion.  
He'd bolted golden wheels to the legs of each so all on their own speed, at a nod from him, they could roll to halls where the gods convene then roll right home again—a marvel to behold.

**Homer, *The Iliad*, Book XVIII**

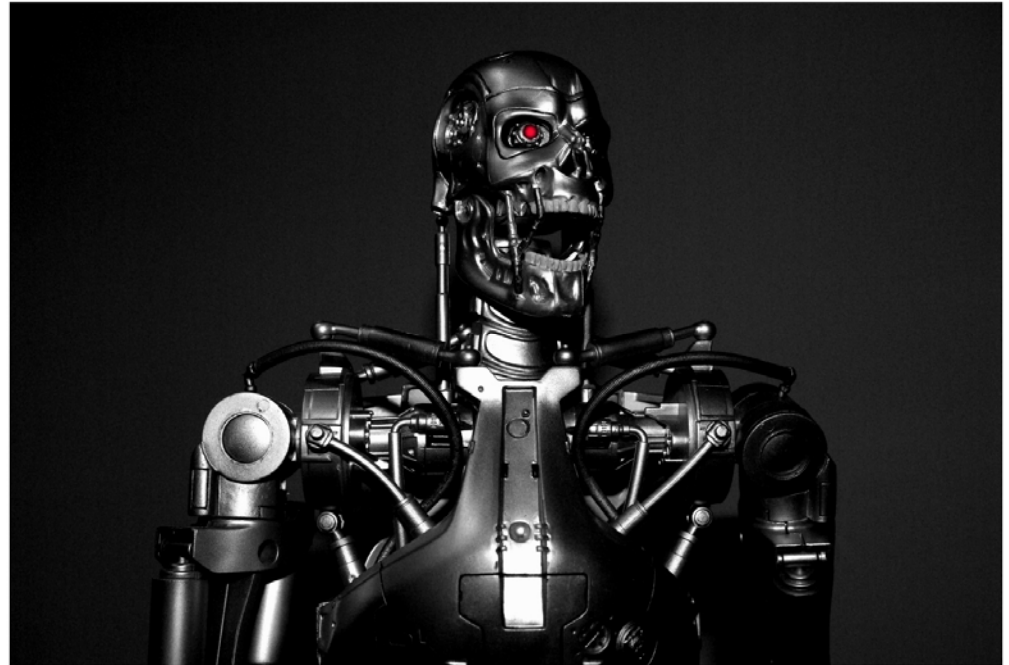


*Source: Wikimedia Commons*

## STORY (2)

If the computer can fly airplanes, drive cars, and win at chess, who cares if it is totally nonconscious? But if we are worried about a maliciously motivated superintelligence destroying us, then it is important that the malicious motivation should be real. Without consciousness, there is no possibility of its being real.

***John Searle, What Your Computer Can't Know***



*Source: Flickr*

## Видео материјали

- Igor Živanović, PhD / ODYSSEY Debate: Development of artificial intelligence will cause numerous social and economic problems for people in the near future.  
<https://youtu.be/qraP36bGFyo>
- Nick Bostrom – What happens when our computers get smarter than we are?  
[https://www.ted.com/talks/nick\\_bostrom\\_what\\_happens\\_when\\_our\\_computers\\_get\\_smarter\\_than\\_we\\_are?language=sr](https://www.ted.com/talks/nick_bostrom_what_happens_when_our_computers_get_smarter_than_we_are?language=sr)
- TEDxMaastricht - Luciano Floridi - "The fourth technological revolution"  
<https://www.youtube.com/watch?v=c-kJsyU8tgl>
- Max Tegmark – How to get empowered, not overpowered, by AI  
[https://www.ted.com/talks/max\\_tegmark\\_how\\_to\\_get\\_empowered\\_not\\_overpowered\\_by\\_ai](https://www.ted.com/talks/max_tegmark_how_to_get_empowered_not_overpowered_by_ai)
- Ray Kurzweil – Get ready for hybrid thinking?  
[https://www.ted.com/talks/ray\\_kurzweil\\_get\\_ready\\_for\\_hybrid\\_thinking](https://www.ted.com/talks/ray_kurzweil_get_ready_for_hybrid_thinking)
- John Searle – Our shared condition - consciousness  
[https://www.ted.com/talks/john\\_searle\\_our\\_shared\\_condition\\_consciousness?language=sr](https://www.ted.com/talks/john_searle_our_shared_condition_consciousness?language=sr)

## Development of artificial intelligence will cause numerous social and economic problems for people in the near future

Material for teachers

With methodological guidelines, a lesson plan and an answer key to worksheets

The educational package "Development of artificial intelligence will cause numerous social and economic problems for people in the near future" was developed within "Oxford debates for the Youths in Science Education" project.

It is a key material, facilitating the achievement of primary project goals, including increasing reasoning skills and interest in STEM, which in the future may result in taking up a scientific career.

When preparing students for the debate, one should not neglect the development of such skills as: communication excellence, argumentation or public speaking. Students should improve their ability to persuade effectively, argue properly, reason accordingly and speak out correctly. Composition of texts, using rhetorical means in oral statements, speaking in accordance with the rules of language culture, text interpretation, public speaking and presentation of texts, discussions and negotiations are of equally high importance.

In order to achieve the abovementioned goals, the implementation of thematic educational packages should be preceded by classes dedicated to preparation for debating as such. This can be accomplished in consultation with teachers of other subjects and the class teacher. The development of basic communication skills can be included in the class teacher's work plan, and the prepared lesson plans can be used during regular classes. Auxiliary materials can be found in the following documents:

1. **Warm up practice**– [Annex No 2 to National frameworks for implementation of Oxford debates in STEM in school practice](#); This document includes the following exercises: active listening, public speaking and debating skills.
2. **Lesson plans aimed at general development of debating skills** – [Annex No 2 do National frameworks for implementation of Oxford debates in STEM in school practice](#) ;

This material consists of 7 lesson plans prepared by Dr. Foteini Englezou, president of the Hellenic Institute for Rhetorical and Communication Research. Scenarios are a guide to work. It is not necessary to follow all the lessons. The teacher can decide which scenarios (or their selected fragments) are most useful for working with a specific group of students. The document offers the following lesson plans:

1. Communication skills
2. Express your scientific argument, not your opinion
3. Build a valid scientific argument
4. Searching for evidence
5. Enhancing students' linguistic skills
6. Rebuttal and refutation
7. Fallacies



### 3. [Methodological Guide for Teachers. ODYSSEY: Oxford Debates for Youths in Science Education](#)

The final stage of preparation for debates based on specific packages is to familiarize students with the principles of debating, described in detail in the abovementioned document.

## **Development of artificial intelligence will cause numerous social and economic problems for people in the near future.**

"Development of artificial intelligence will cause numerous social and economic problems for people in the near future" educational package consists of the following elements:

- Multimedia presentation;
- Video- recording based on the presentation: <https://youtu.be/qraP36bGFyo>
- Educational package "Development of artificial intelligence will cause numerous social and economic problems for people in the near future" - material for students;
- Worksheets (the same for all packages);
- "Development of artificial intelligence will cause numerous social and economic problems for people in the near future" - material for the teacher (with answer key).

It is recommended to implement the package during a minimum of three lesson units.

Over the past twenty or more years, computers have improved and have outperformed humans in many aspects and AI methods are used today in numerous areas. Autopilots have been in use for a while, and today we have cars that use artificial intelligence instead of a human driver. A good medical diagnosis of breast cancer, for example, is almost unthinkable without the use of a computer. Artificial intelligence also helps the police, the military, it is widely used in economics, trade, etc. However, artificial intelligence can be used maliciously or become malicious in the near or distant future so we need to see how we can predict, prevent or mitigate the detrimental effects that the radical development of AI can lead to.

The presented educational package "Development of artificial intelligence will cause numerous social and economic problems for people in the near future" includes an overview of the development of AI, its advantages and drawbacks, as well as possible problems AI would cause humans in the close future. It also allows students to formulate arguments for and against the use of artificial intelligence in our everyday lives.

The debate on the resolution: "Development of artificial intelligence will cause numerous social and economic problems for people in the near future" may take place both during extracurricular activities in the field of technology, and in IT lessons. The level of the materials is adjusted mainly to secondary schools.

### **Lesson 1. What is AI and what is its impact on everyday lives of humans?**

Artificial intelligence is certainly not a novel concept for high school students. Although forms of artificial intelligence are very much present in our everyday lives, students may not be familiar with all the benefits, as well as dangers, of enthusiastically embracing it. Therefore, a critical view is necessary - in the form of pro and con arguments - so that students would have a more in-depth insight of all the ways technology, and AI in particular, could be used or misused.

It is recommended that students receive the materials a few days prior to the lesson. This will allow them to get acquainted with the topic of the lesson initially and facilitate active participation in the classroom. A multimedia

presentation or a video recorded by the author of the package can be used during the lesson. An open discussion of selected (previously assigned to students) applications of AI is also beneficial.

## Lesson 2. „Development of artificial intelligence will cause numerous social and economic problems for people in the near future” – constructing arguments for and against the resolution

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The aim of the second lesson is to formulate as many arguments as possible (both for and against the resolution) that will be used by students during the debate, summarizing the work with the package.

### Lesson plan

1. Organizational issues, checking the attendance list, familiarizing with the topic and objectives of the lesson [5 minutes].
2. Preparation of arguments [25 minutes]
3. The teacher divides the class into teams of two. Each team receives 8 question cards available in the educational package (materials for the student) and 2 copies of worksheet No. 1 (one for each student individually). Based on the questions, students formulate arguments for the presented thesis, against the thesis and those that are debatable and can be used in the discussion by both parties. Students work together, but each student individually completes his/her worksheet. There are examples of selected arguments for worksheet 1 in the answer key.
4. Teams: proposition and opposition are formed [10 minutes].

Team selection may be executed in 2 forms, each of them having both advantages and disadvantages.

Students declare which arguments are closer to their beliefs. The teacher divides the class into teams (each with a similar number of students) in the manner reflecting their convictions. The second method assumes a division similar to the one above, with the difference that ultimately the team consisting of the supporters of a given resolution becomes the "opposition" team, while the opponents of the thesis become "proposition" team. The supporters of such a division assume that it teaches the participants of the debate to a greater extent to use arguments supported by facts, and is less based on emotions. Alternatively, division into teams can also be done randomly.

Finally, team selection can also be made by the teacher in a subjective way, ensuring that each team has both leaders and students who require more help, so that both teams have similar "winning potential". In order to save time for division, the teacher can do it at the beginning of the lesson, for example by distributing worksheets number 1 to the students, printed on sheets of different colour or marked in some other manner.

5. The teacher distributes worksheets number 2 to the students (one for each student) and explains the homework. An example of a filled out worksheet is available in the answer key.
6. Students in each team read prepared arguments in accordance with the assignment to a given group. Each student receives 1 argument, which he/she will develop (as homework) according to the guidelines in worksheet No. 2.
7. Each team also appoints 3 people who will present the arguments prepared by the entire group. Students decide the order of their speeches. During the debate, other team members who are not directly involved in the debate, fill out worksheet
8. Summary of the lesson, evaluation of students' work [5 minutes].

## Lesson 3. Debate

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During the final lesson, the teams conduct a debate according to the guidelines contained in the "Methodological Guide ...". It takes 45 minutes in total to conduct a full debate. During the debate, the teacher does not comment on the arguments or indicate the fallacies made by the students on an ongoing basis.

An exercise-based debate should be structured as follows:

1. Opening of the debate by the moderator/chaiperson [3 minutes].
2. Initial vote by the audience [2 minutes].
3. 1 st Researcher-Debater of the A research-team: Constructive Speech [4 minutes].
4. 1 st Researcher-Debater of the B research-team: Constructive Speech [4 minutes].
5. Cross-fire between the researchers-debaters (1) of both research teams [3 minutes].
6. 2 nd Researcher-Debater of the A research-team: Rebuttal Speech [4 minutes].
7. 2 nd Researcher-Debater of the B research-team: Rebuttal Speech [4 minutes].
8. Cross-fire between the researchers-debaters (2) of both research teams [3 minutes].
9. Preparation time for the Summary and Final Rebuttal by both research teams [2 minutes].
10. 3 rd Researcher-Debater of the A research-team: Summary Rebuttal [2 minutes].
11. 3 rd Researcher-Debater of the B research-team: Summary Rebuttal [2 minutes].
12. Grand Cross-fire between the researchers-debaters (1 & 2) of both research-teams [3 minutes].
13. 3 rd Researcher-Debater of the A research-team: Final Focus Rebuttal [2 minutes].
14. 3 rd Researcher-Debater of the B research-team: Final Focus Rebuttal [2 minutes].
15. Final vote by the audience / Short written feedback [3 minutes].
16. Presentation of the results by the moderator [2 minutes].

If the debate takes place during extra-curricular activities, then it is recommended to devote, for example, 90 minutes for this part. This will allow you to prepare the room for the debate, recall the rules, conduct the debate and discuss its course and finally evaluate the work of students.

In terms of classroom conditions, it would be ideal to allocate two adjoining lesson units to the debate. Taking into account the school circumstances, organizational difficulties and the inability to devote too many lessons to content extending the core curriculum, the debate can be conducted in one lesson, while maintaining high discipline in time. In this case, it is recommended that during the next lesson with the class additional 10 minutes are spent discussing the debate, pointing to strengths and mistakes made by the participants of the debate.

In this format, 6 students (3 from each team) actively participate in the debate. The teacher may also appoint a moderator from among the students and a time keeper. The rest of the students will receive worksheet number 3. Their task will be to listen carefully to the debate and to note the opposing team's strengths and areas for improvement, and to justify their choice. Completed worksheet no. 3 may be the basis for issuing a grade for activity in the lesson for students who did not take part in the debate directly, but participated in its preparation and were active observers of its course.

## Worksheet No 1 – answers

FOR	„GREY AREA“	AGAINST
<p><i>Is it possible to create machine intelligence on a human level?</i></p> <p>Based on the testimony of AI experts, Nick Bostrom predicts that the chances of human-level machine intelligence (AI which passes the Turing test) are 10 percent by 2030, 50 percent by 2050, and 90 percent by 2100.</p> <p><i>What is the difference between brain simulation and brain emulation?</i></p> <p>While the simulation mimics the results, the emulation mimics the internal causal dynamics, and the emulation is successful if the emulated system produces the behavior and results as the original. If brain activity is seen as a function physically realized by the brain, then it will be possible to realize the process on a Turing machine.</p> <p><i>Does AI perform some tasks better than humans?</i></p> <p>AI is used for face recognition at border crossings, solving complex mathematical problems. AI is used in economics, the securities market and trade in</p>	<p><i>Should AI be directed to innovations or to sheer mimic?</i></p> <p>In the spring of 2016, the New Rembrandt appeared - a portrait of a middle-aged man created entirely by artificial intelligence. The complex process of creating a new "Rembrandt" work involved computer analysis of 346 paintings by this great artist, the use of deep learning algorithms, and the reproduction of textures and brush strokes required an analysis of more than 165,000 fragments of Rembrandt's original works. Finally, the image was printed using a 3D printer.</p> <p><i>How is AI controlled?</i></p> <p>Artificial intelligence can be used maliciously or become malicious in the near or distant future.</p> <p><i>What is Moravec's paradox?</i></p> <p>The term "Moravec's paradox" means that things that are easy for humans to do are difficult for robots, and vice versa.</p>	<p><i>Are scientists close to emulating human nervous system?</i></p> <p>Bostrom himself admits that we are not even close to emulating a cylindrical worm nervous system that has only 320 neurons, whose functions are well studied and known. the human brain is made up of about 100 billion neurons.</p> <p><i>Are machines close to passing the Turing test?</i></p> <p>Alan Turing predicted that machines would be able to pass the Turing test successfully by 2000, exactly 50 years since the prediction was made. Of course, that year, computers weren't even close to passing the Turing test. In 2013, Eric Schmidt from Google stated that computers could pass the Turing test in the next five years, by 2018. Today, we are on the verge of 2020, and no computer is even close to passing the Turing test, and in 100 years, probably none of us will be around to testify that the predictions were wrong.</p> <p><i>Are robots limited by their program algorithm and purpose?</i></p>

<p>general... Robots help people with dementia and children with autism.</p> <p><i>Are machines capable of artistic imagination?</i></p> <p>In 2016, a computer program co-authored the novel "Day" when a computer wrote a novel that was shortlisted for a literary prize in a competition in which other authors were people.</p> <p><i>How can we solve the problem of AI abuse?</i></p> <p>One of the ways to deal with this problem is to make the future machines with built-in ethical algorithms, so that they would not pose a threat to human safety.</p>		<p>The behavior of machines at the current level of development of science and technology is rigid and limited by program algorithms and purpose - a robot that packs books cannot cook or iron clothes, no matter how intelligent it may seem, nor can a computer that plays chess better than the best chess player.</p> <p><i>Should technology copy art?</i></p> <p>it was humans who provided the deep learning program with fragments of Rembrandt's works. When it comes to the New Rembrandt, Jonathan Jones, an art critic of the British Guardian, wrote "What a horrible, tasteless, insensitive and soulless travesty of all that is creative in human nature. What a vile product of our strange time when the best brains dedicate themselves to the stupidest "challenges", when technology is used for things it should never be used for and everybody feels obliged to applaud the heartless results because we so revere everything digital"</p> <p><i>Are machines capable of independent artistic creation?</i></p> <p>Machines, regardless of how autonomous they seem, cannot do it on their own. Finally, if machines are not conscious - and they are not - and there is no sign that they will be in the near future, then there is nothing that depends on consciousness in the strict sense of the word, such as knowledge, daydreaming and creative imagination, and there is no art produced by AI.</p>
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The project has been funded with the support of European Commission within ERASMUS+ program



		<p><i>What are the real risks of supermachines?</i></p> <p>The real risks and threats are related to the "malicious use of AI technology", which means that the real threat is not posed by intelligent machines, because machines are not intelligent in any relevant psychological sense and the question is whether they will be any time soon, but by people who use "intelligent" machines.</p>
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## Worksheet No 2 – examples of argument - PRO

Argument with reasoning	Foreseen rebuttals of the other group	Answers to rebuttals
<p>Machines (artificial intelligence) can perform many activities and jobs better than people.</p> <p>In 1997, a computer called <i>Deep Blue</i> defeated world chess champion Gary Kasparov. Kasparov later claimed to have seen traces of true intelligence and creativity in some of the moves made by the computer.</p>	<p>Machines (artificial intelligence) have numerous difficulties doing jobs that people do with ease. Anyone with average intelligence can see that a wooden chessboard can be used as firewood (when lacking a better one), and not just for playing chess. It is possible that robots "know" how to pack books in a box better than humans, but the same robots do not know how to use a book to kill a cockroach.</p>	<p>A good medical diagnosis of breast cancer, for example, is almost unthinkable without the use of a computer. Computers suggest a treatment plan and can interpret the electrocardiogram. Robots help people with dementia and children with autism.</p>
	<p>Machines (for now) have no consciousness, and the creative imagination dependent on it, so they cannot create works of art.</p>	<p>Artificial intelligence helps the police classify offenders based on a large number of variables and decide on keeping them in custody. Unmanned aerial vehicles are used in military operations, and robots are trained to dismantle bombs.</p> <p>Machines can, or will in the future, create works of art just as well or better than humans.</p> <p>While many worry that intelligent robots will take over human jobs (as many in the 18th century worried that the Industrial Revolution would bring great misfortune including job loss), it is possible that intelligent machines, maybe more intelligent than humans, will become more dominant in the production of works of art.</p>

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		<p>In 2016, a computer program co-authored the novel "Day" when a computer wrote a novel that was shortlisted for a literary prize in a competition in which other authors were people. In the spring of the same year, the New Rembrandt appeared - a portrait of a middle-aged man created entirely by artificial intelligence.</p>
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## Worksheet No 3 – examples of argument - CON

Argument with reasoning	Foreseen rebuttals of the other group	Answers to rebuttals
<p>Machines (artificial intelligence) have numerous difficulties doing jobs that people do with ease. Anyone with average intelligence can see that a wooden chessboard can be used as firewood (when lacking a better one), and not just for playing chess. It is possible that robots "know" how to pack books in a box better than humans, but the same robots do not know how to use a book to kill a cockroach.</p>	<p>A good medical diagnosis of breast cancer, for example, is almost unthinkable without the use of a computer. Computers suggest a treatment plan and can interpret the electrocardiogram. Robots help people with dementia and children with autism.</p>	<p>Intelligent machines pose a risk to the safety of humans.</p> <p>Artificial intelligence can be used maliciously or become malicious in the near or distant future. For this reason, we need to see how we can predict, prevent or mitigate the detrimental effects that the radical development of AI can lead to.</p>
	<p>In the spring of 2016 year, the New Rembrandt appeared - a portrait of a middle-aged man created entirely by artificial intelligence. The complex process of creating a new "Rembrandt" work involved computer analysis of 346 paintings by this great artist, the use of deep learning algorithms, and the reproduction of textures and brush strokes required an analysis of more than 165,000 fragments of Rembrandt's original works. Finally, the image was printed using a 3D printer. The result amazed many,</p>	<p>Advances in technology are changing the rules of war. In the modern world, cyber attacks are a common occurrence. For example, the computer virus <i>Stuxnet</i>, allegedly developed by some of the governments (the USA and Israel are mentioned), has caused enormous damage to the Iranian nuclear program.</p> <p>When it comes to the New Rembrandt, Jonathan Jones, an art critic of the British Guardian, wrote "What a horrible, tasteless, insensitive and soulless travesty of all that is creative in human nature. What a vile product of our strange time when the best brains dedicate themselves to the stupidest "challenges", when technology is used for things it should never be used for and everybody feels obliged to applaud the heartless results because we so revere everything digital", Jones wrote at the time.</p>

	and the endeavor received huge media attention and brought numerous awards to the participants.	Similar skepticism is expressed when it comes to other works of AI.
		The real risks and threats are related to the "malicious use of AI technology", which means that the real threat is not posed by intelligent machines, because machines are not intelligent in any relevant psychological sense and the question is whether they will be any time soon, but by people who use "intelligent" machines.