ENARIS

Artificial Intelligence

mobilis
interaktív kiállítási központ

TU Graz

OESTERREICHISCHE COMPUTER GESELLSCHAFT ®
AUSTRIAN COMPUTER SOCIETY

Interreg
Austria-Hungary 2014-2020
European Union – European Regional Development Fund

Definition

Artificial Intelligence

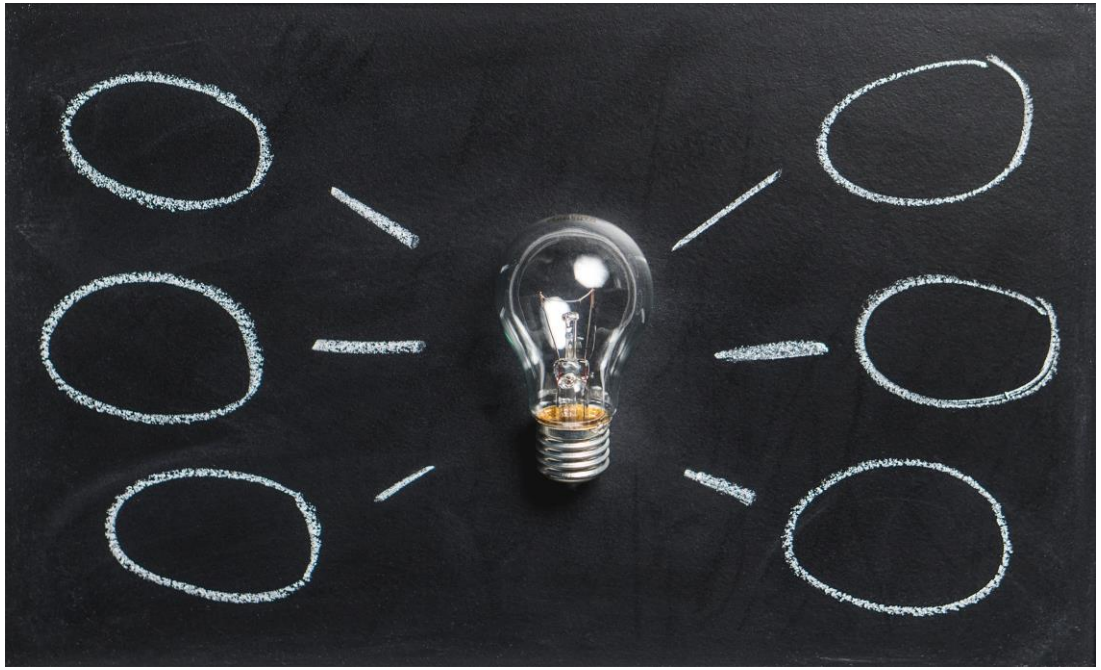
- Field in Computer Science
  - Creating intelligent machines

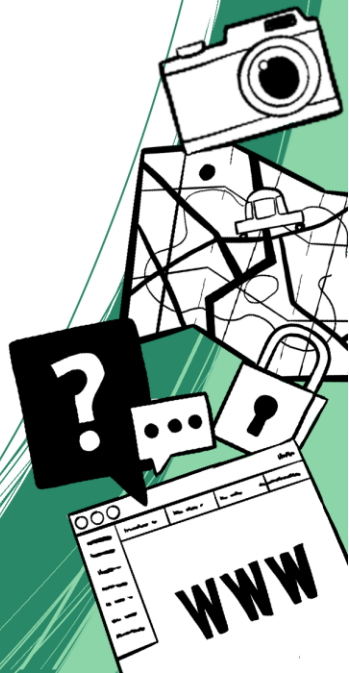
Artificial Intelligence

- Field in Computer Science
  - Creating intelligent machines
- There is **no uniform definition** of (artificial) intelligence in computer science!

What is intelligence?

1. How do **you define** intelligence or intelligent behaviour?



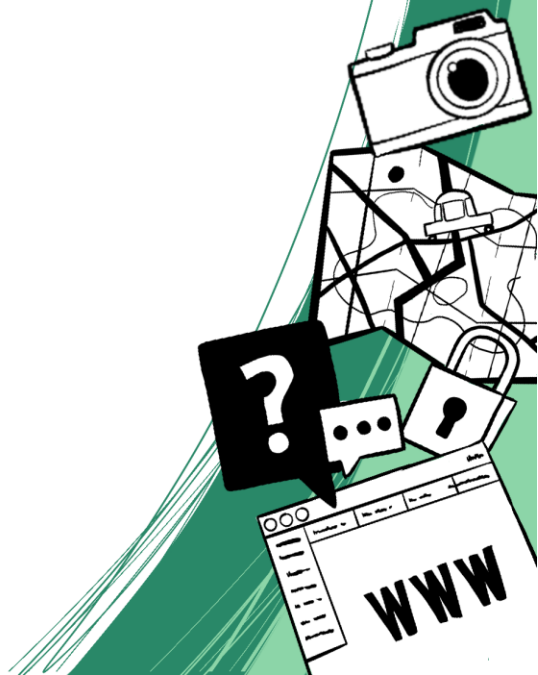


What is intelligence?

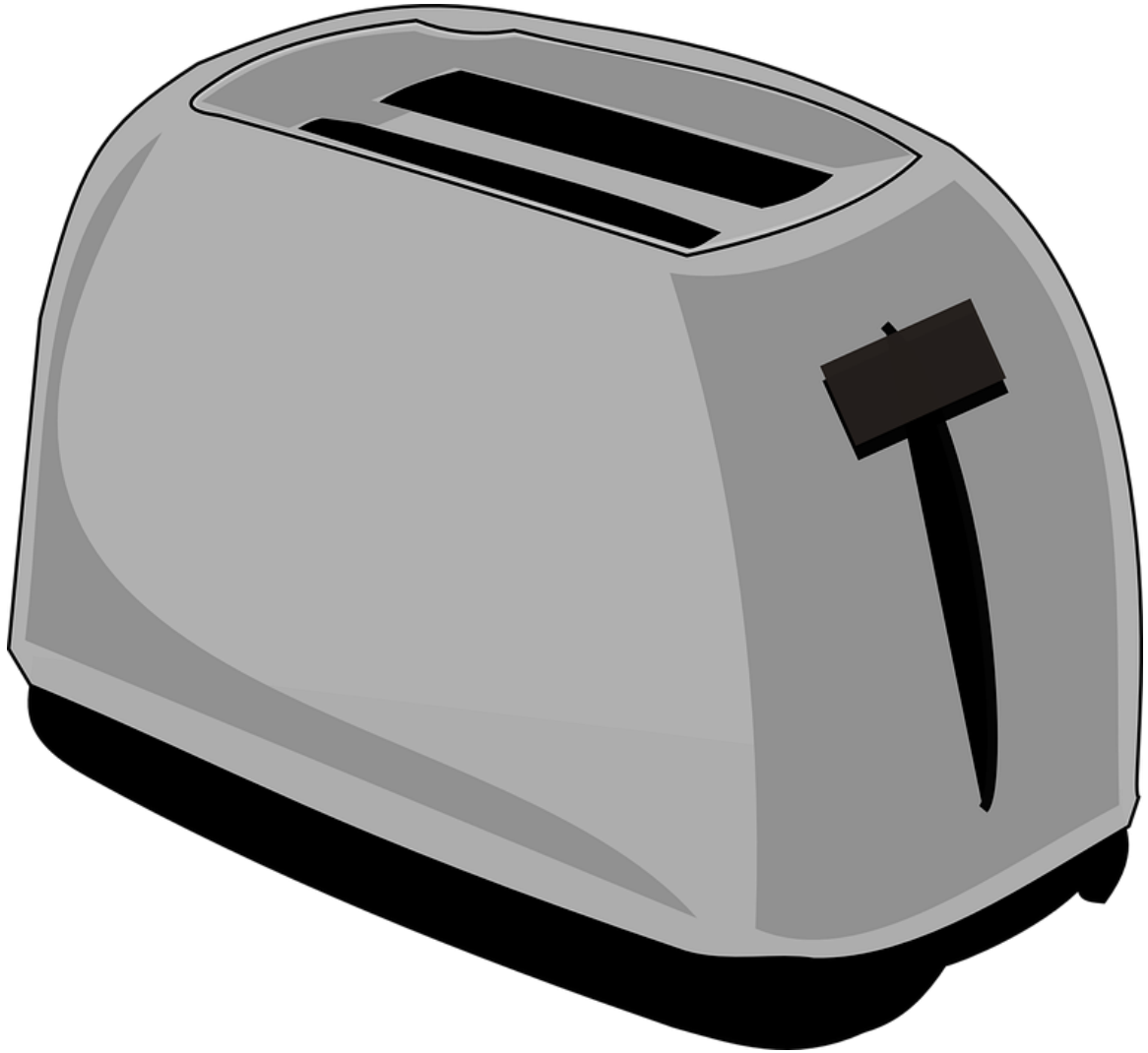
1. How do **you define** intelligence or intelligent behaviour?
2. Use your definition to **decide how intelligent** the following things are.

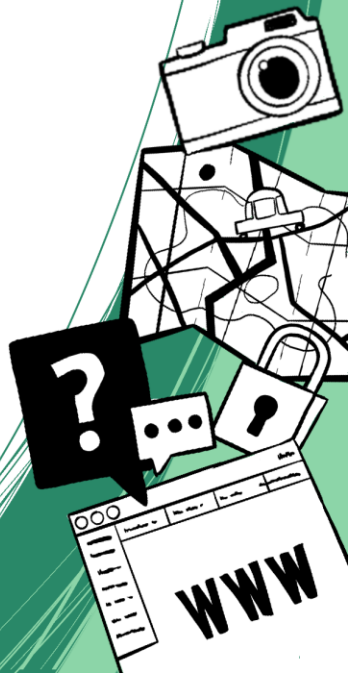
0 — 5

not intelligent — **very** intelligent



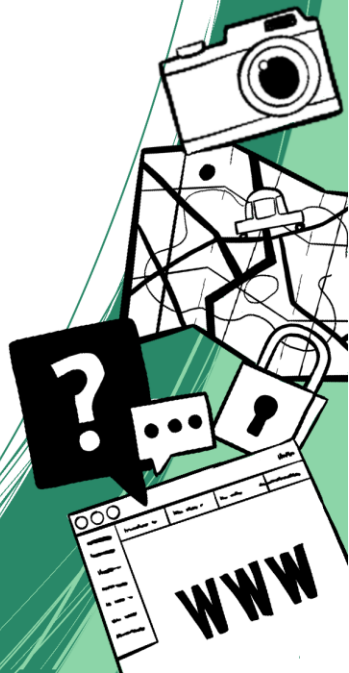
1. Toaster



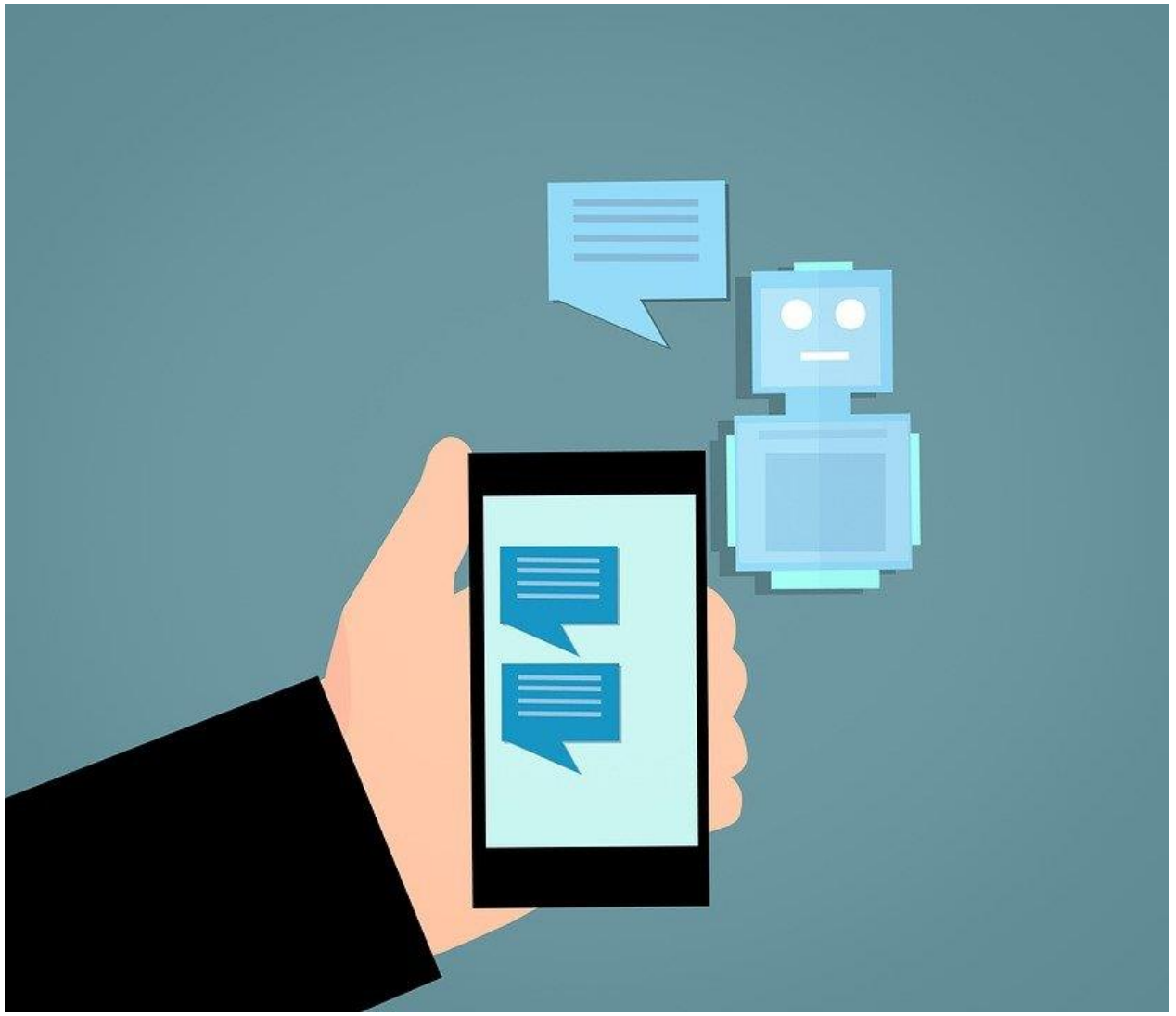


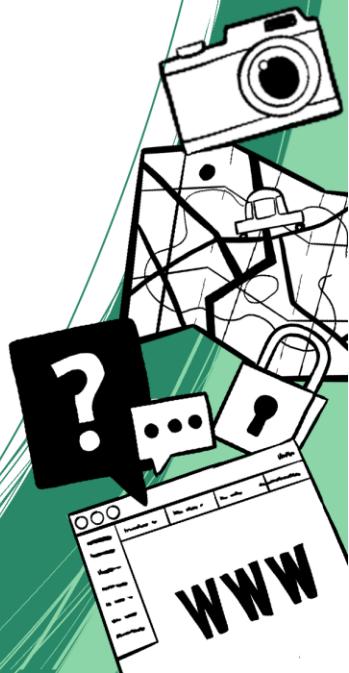
2. Calculator

3. Chess playing robot



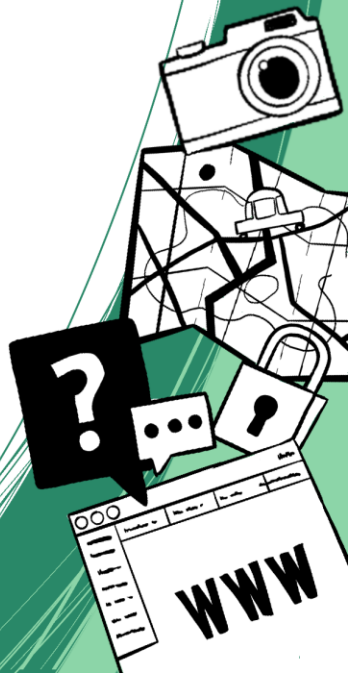
4. Chatbot



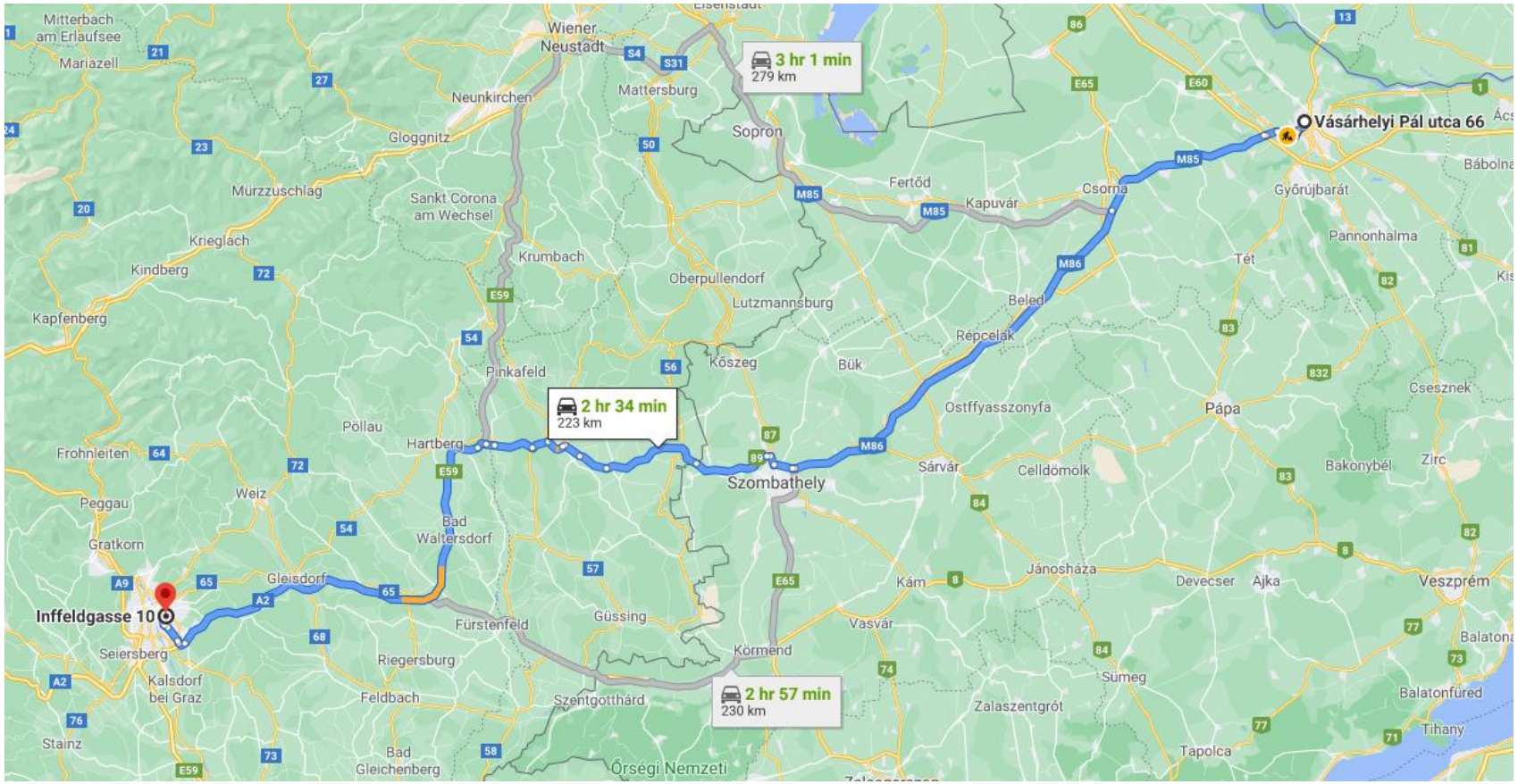


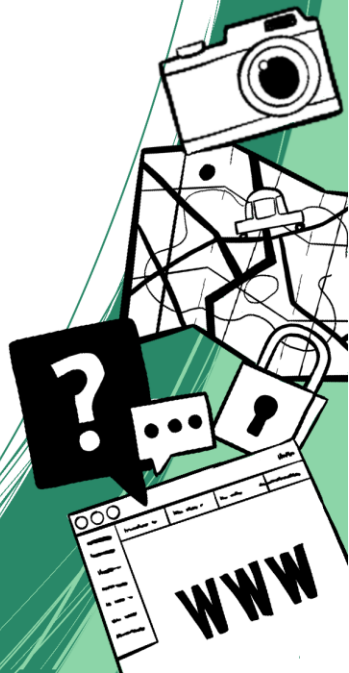
5. Self driving car

6. Cleaning robot

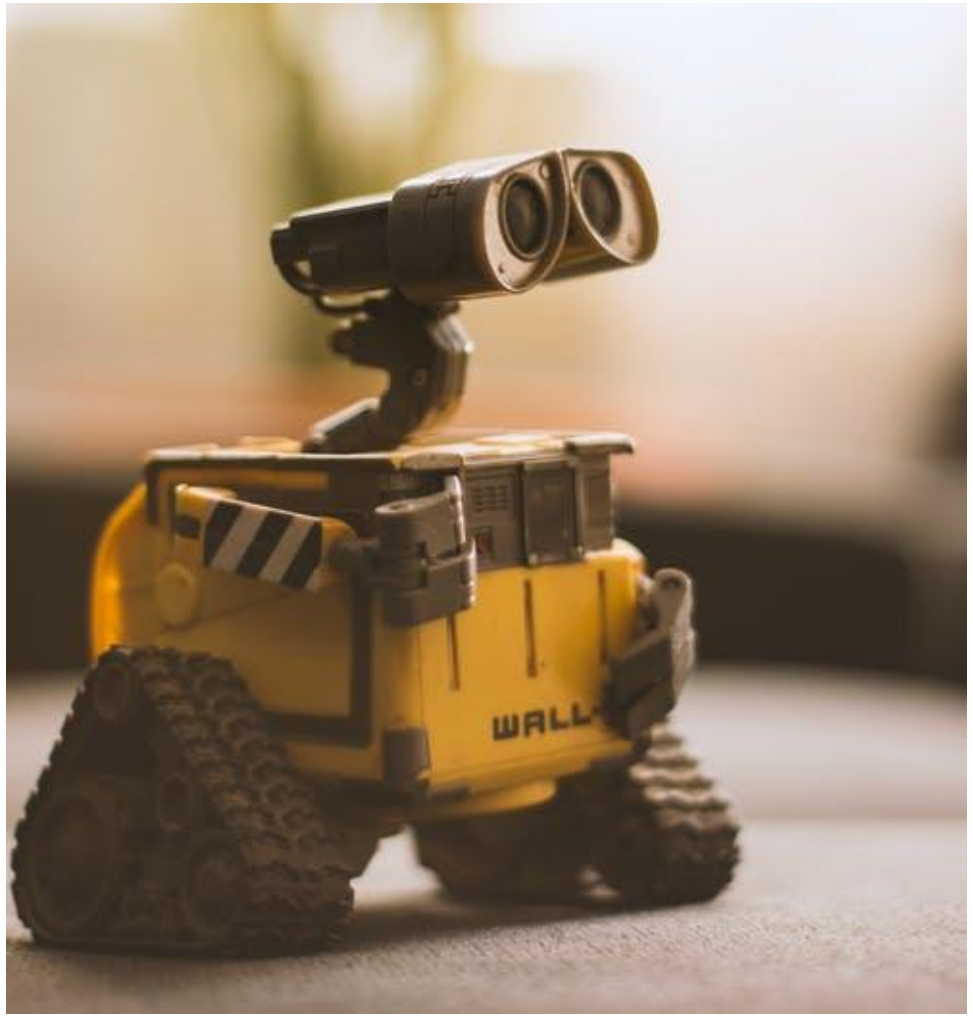


7. Navigation app





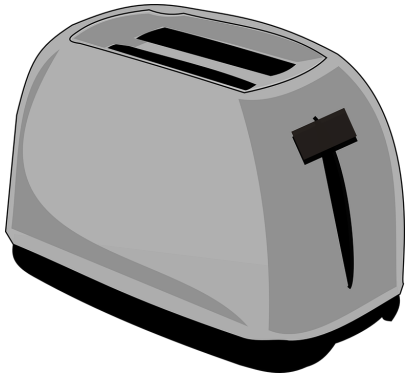
8. Earth-cleaning robot



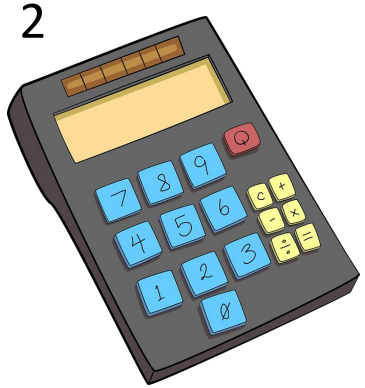
What is intelligence?

- Which of the things did you categorize as more **intelligent**?
  - Why those and not the others?

1

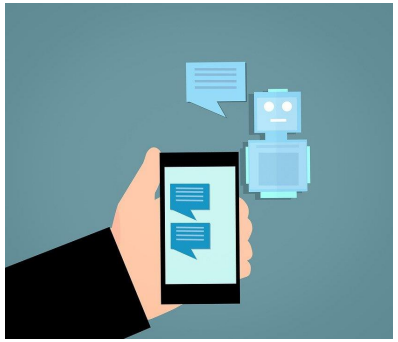


2



3

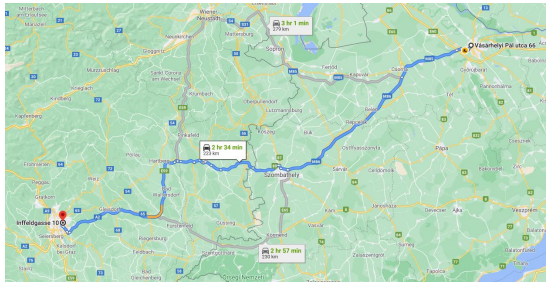
4



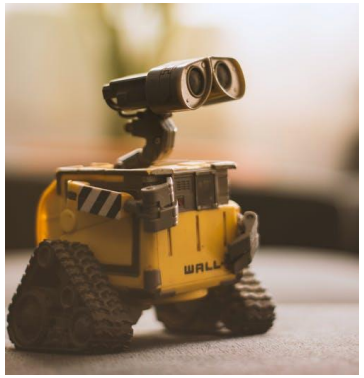
5

6

7

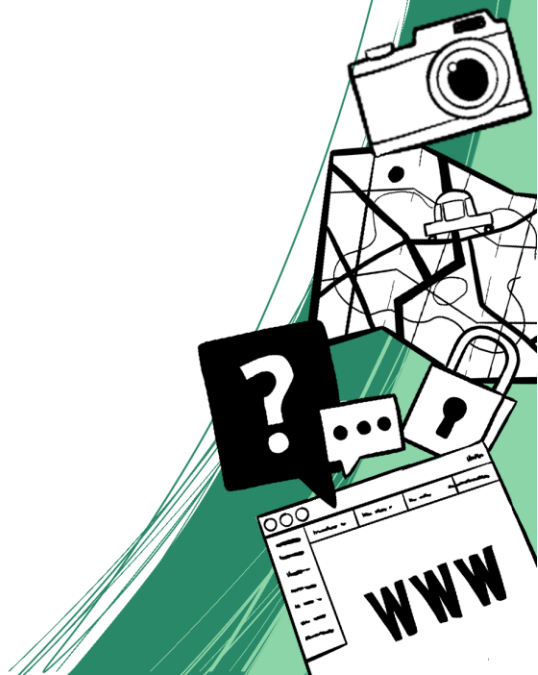


8



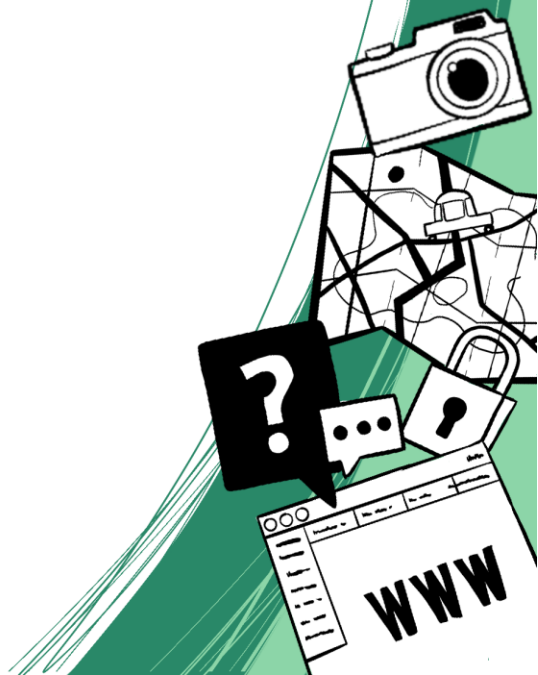
Possible Definitions

- “A machine is intelligent, when it **behaves as a human** would in the same situation.”



Possible Definitions

- “A machine is intelligent, when it **behaves as a human** would in the same situation.”
- “Intelligence is the capability of a system to **adapt its behaviour** to meet its goals in a range of environments.”

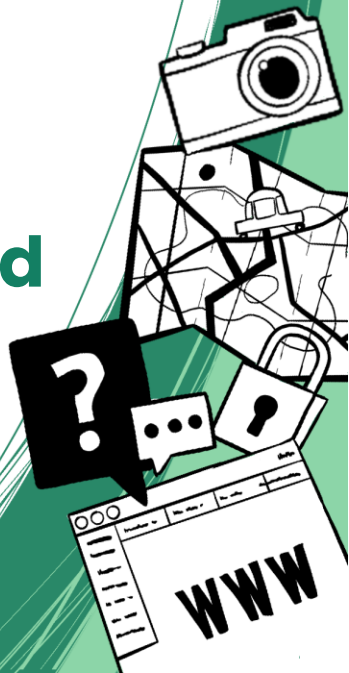


Possible Definitions

- “A machine is intelligent, when it **behaves as a human** would in the same situation.”
- “Intelligence is the capability of a system to **adapt its behaviour** to meet its goals in a range of environments.”
- “Intelligence is the computational part of the **ability to achieve goals** in the world.”

Possible Definitions

- “A machine is intelligent, when it **behaves as a human** would in the same situation.”
- “Intelligence is the capability of a system to **adapt its behaviour** to meet its goals in a range of environments.”
- “Intelligence is the computational part of the **ability to achieve goals** in the world.”
- “Intelligence is clearly a **combination** of the ability to **'figure things out** on the spot' and the ability to **retain and repeat** things that have been figured out in the past.”

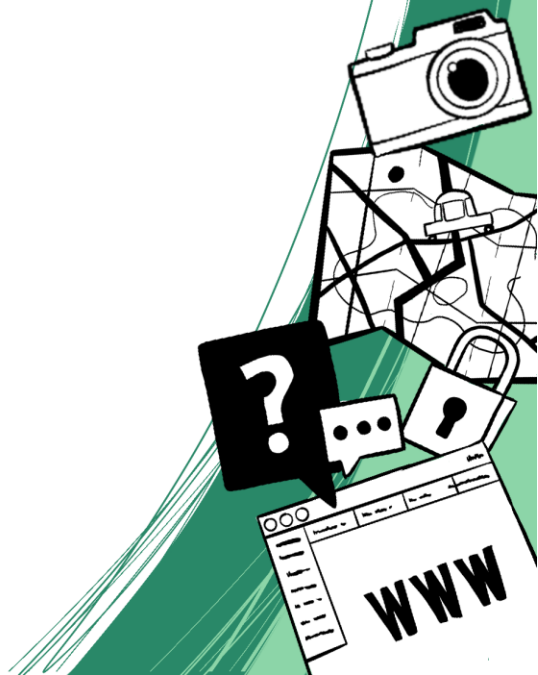


ENARIS

Map of AI

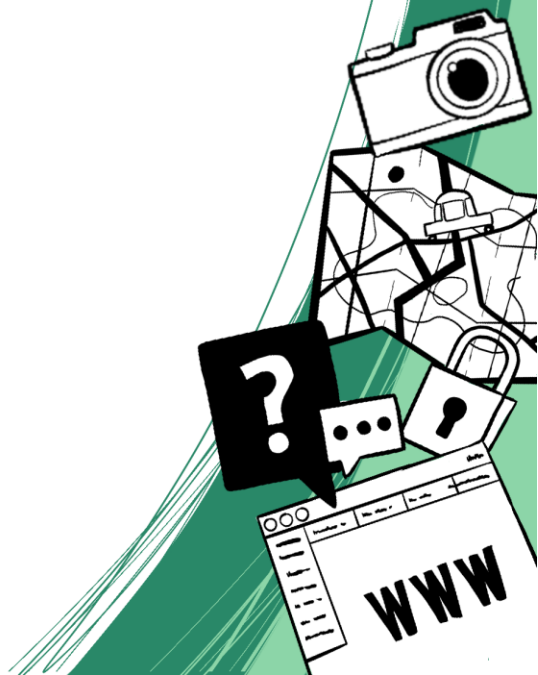
Map of AI

- AI is a **huge field** and includes many subjects



Map of AI

- AI is a **huge field** and includes many subjects
- It can be categorized/structured in **many ways**



Map of AI

- AI is a **huge field** and includes many subjects
- It can be categorized/structured in **many ways**
- The following shows **one way** of structuring AI related fields

ENARIS

Act

Move
Visualize

Sense

Image Recognition
Sensory Data
…

Think

Logic
Pathfinding
…

Neural Networks

Artificial Intelligence

Graphs

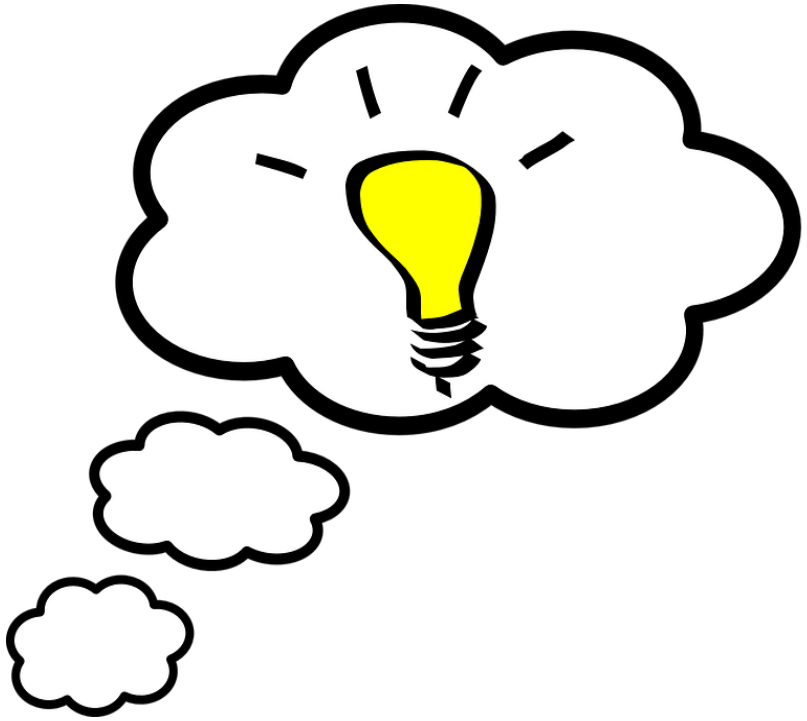
Learn

Supervised Learning
Reinforcement Learning
…

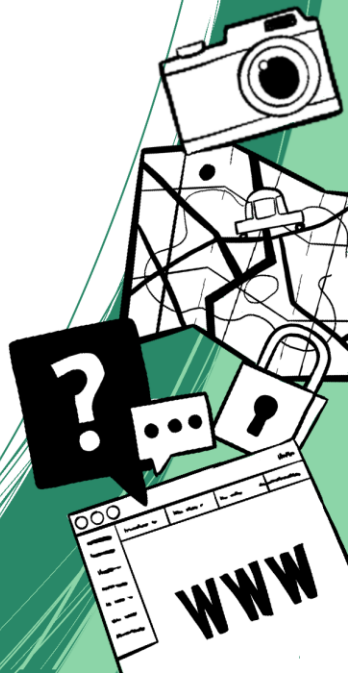
Know

Storing Knowledge
Databases
…

Think

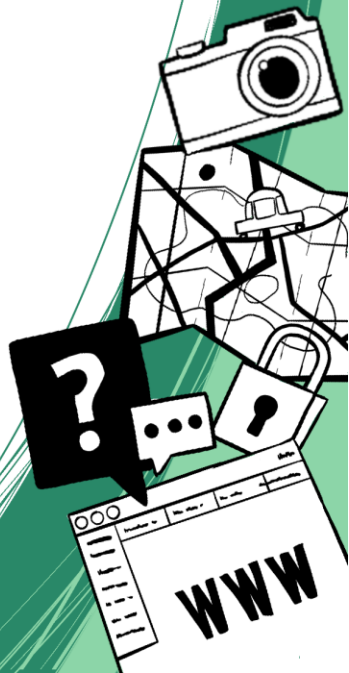


- **Includes**
  - Inference
  - Logic
  - Problem solving
  - …
- **Examples**
  - Finding the shortest path
  - Calculating the value of actions in a game
    - Choosing the best action
  - Inferring true statements from facts

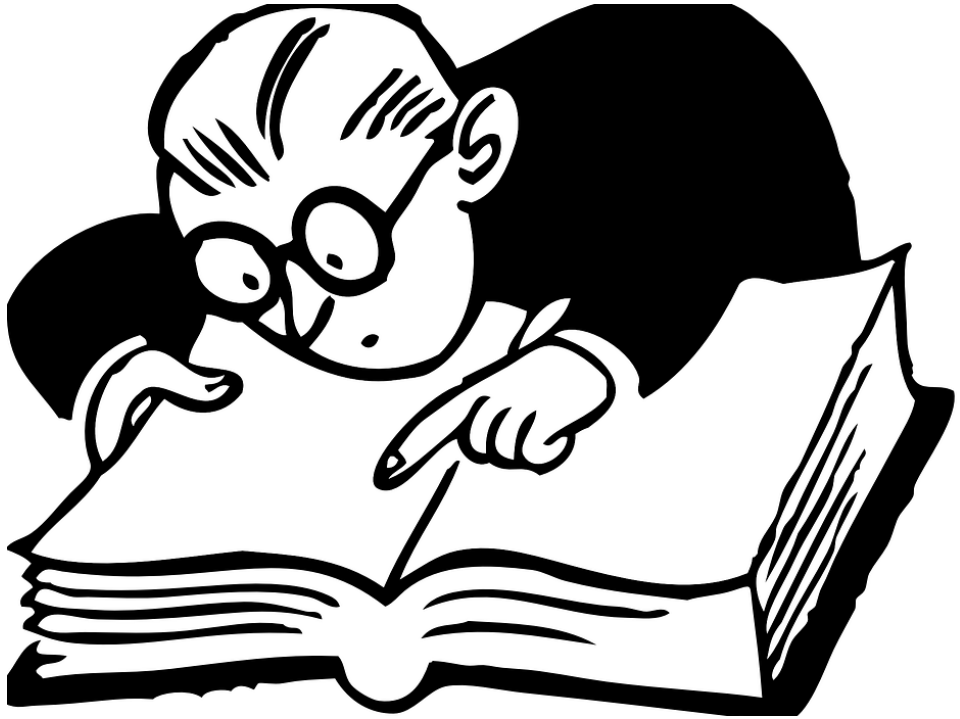


Know

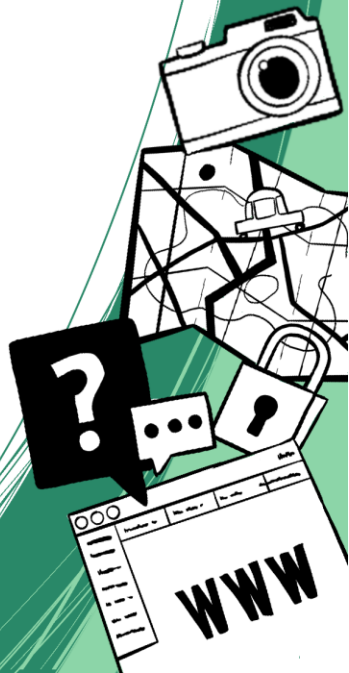
- **Includes**
  - Storing knowledge
  - Databases
  - Ontologies
  - …
- **Examples**
  - Efficiently accessing stored knowledge
  - Storing relations between data
  - Finding good categories to split data into



Learn

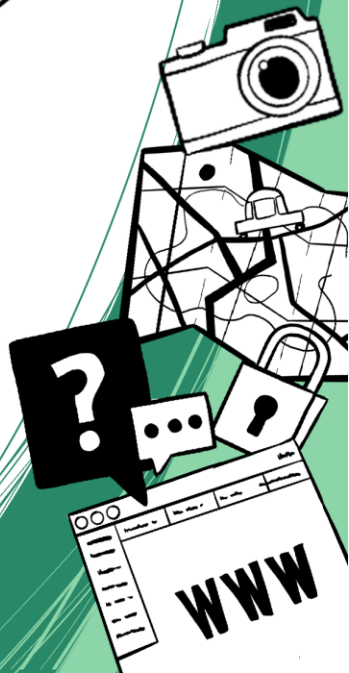


- **Includes**
  - Supervised learning
  - Reinforcement learning
  - Unsupervised learning
  - …
- **Examples**
  - Training algorithms by using examples
  - Training algorithms by using reward and punishment
  - Adaptive (custom) advertisement



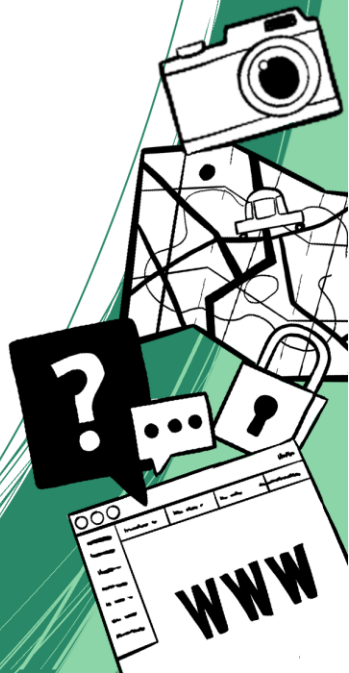
Sense

- **Includes**
  - Anything to perceive the environment
  - Sensory data
  - Image recognition
  - …
- **Examples**
  - Using ultrasonic sensors to detect objects
  - Using cameras to differentiate between people
  - Recognising spoken commands



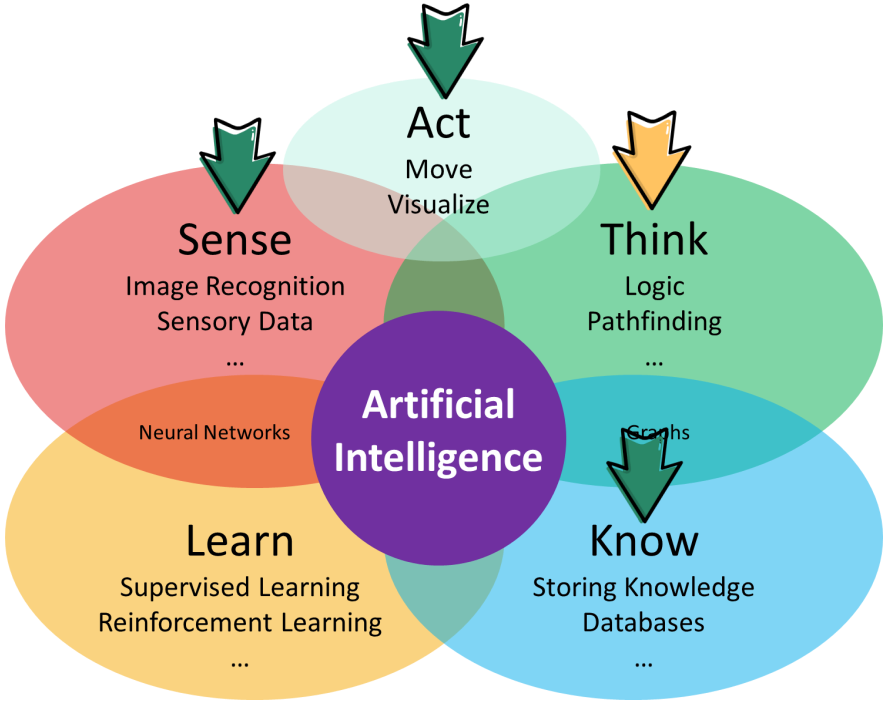
Act

- **Includes**
  - Anything to interact with the environment
- **Examples**
  - Showing results on a display
  - Driving around to the specified target
  - Signalling that there is not enough battery



Categorise examples

- **Where** on the map do the following examples **belong to**?
- Multiple answers possible!

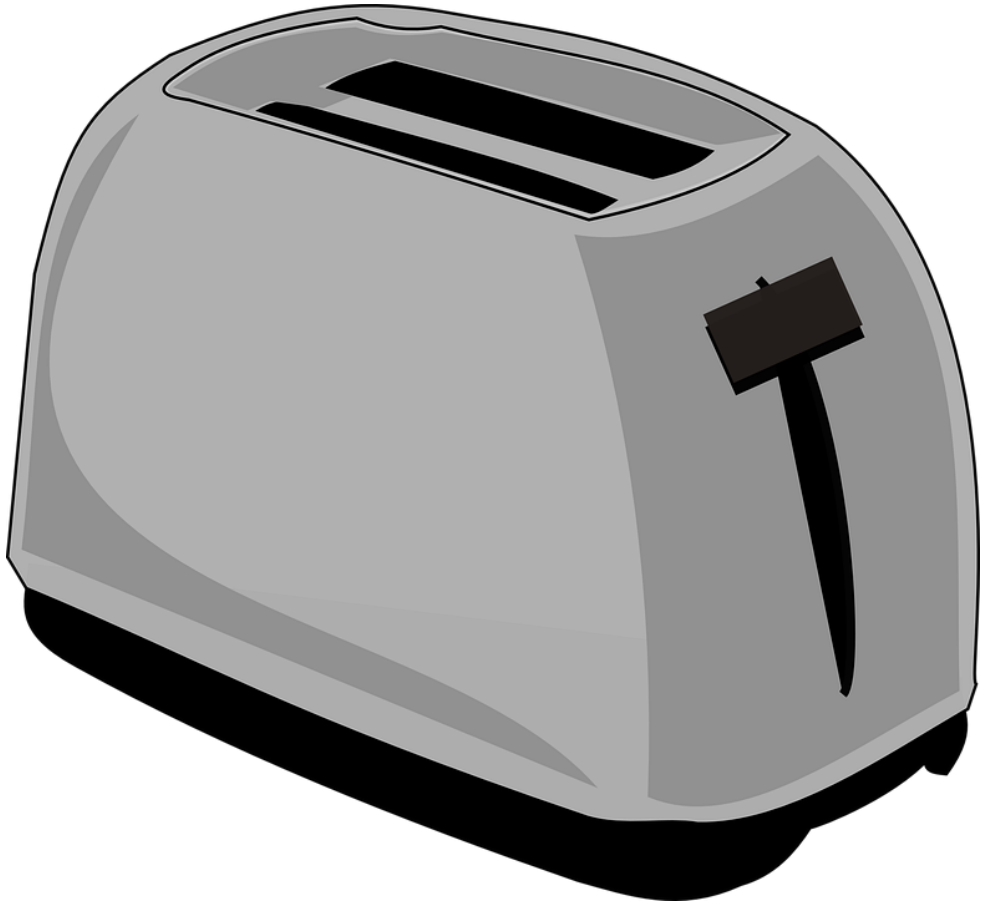


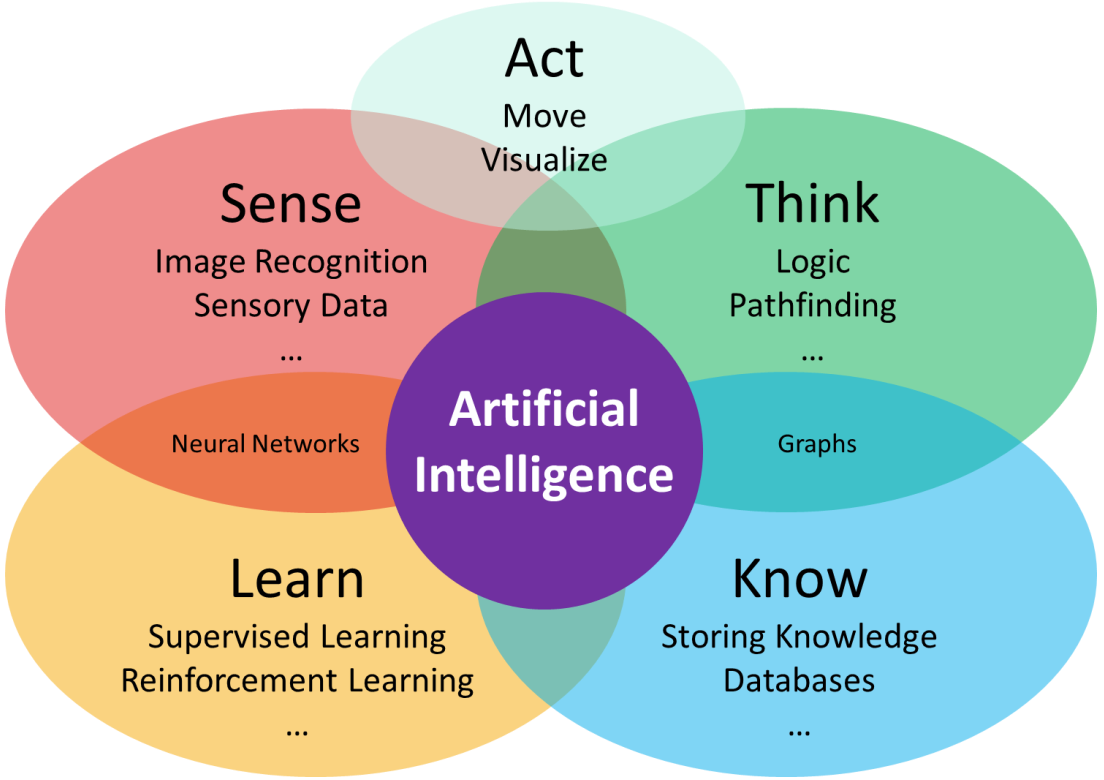
… belongs to

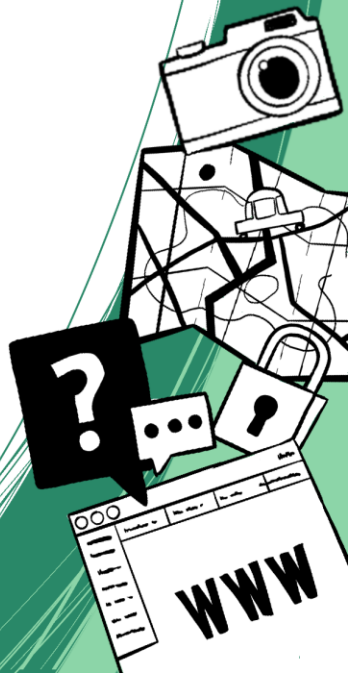
… might belong to

… does probably not belong to

1. Toaster

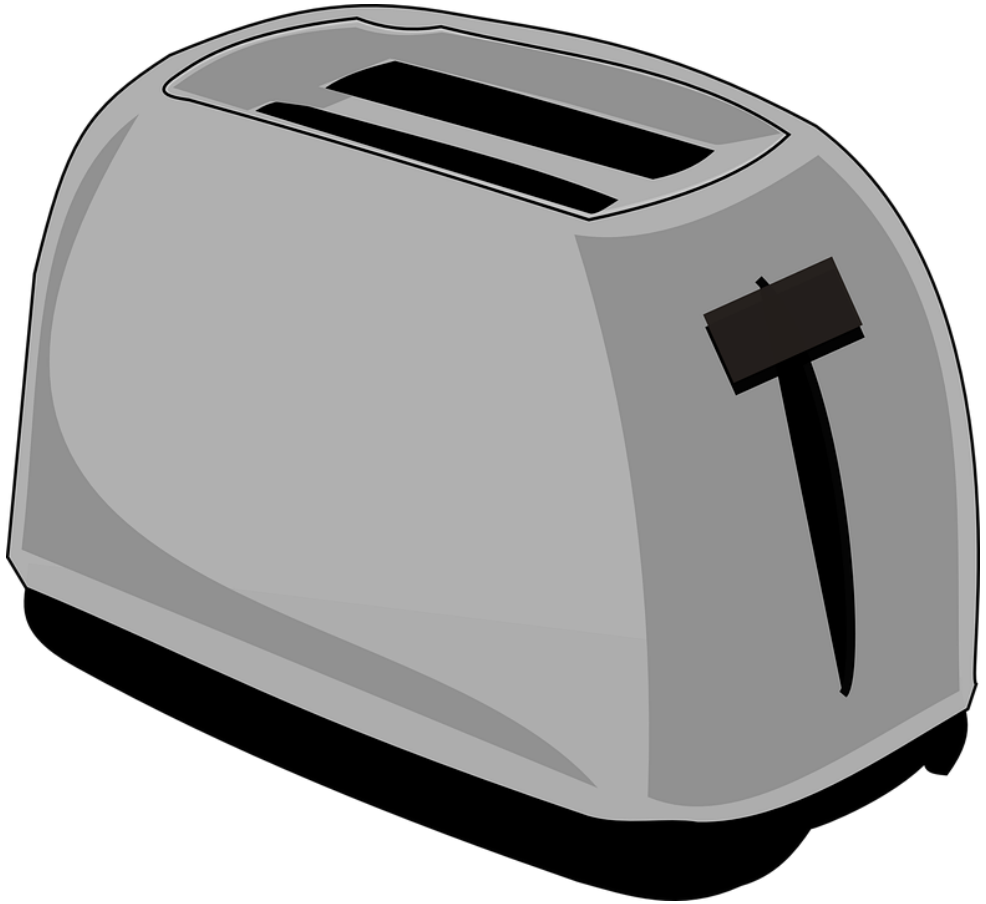


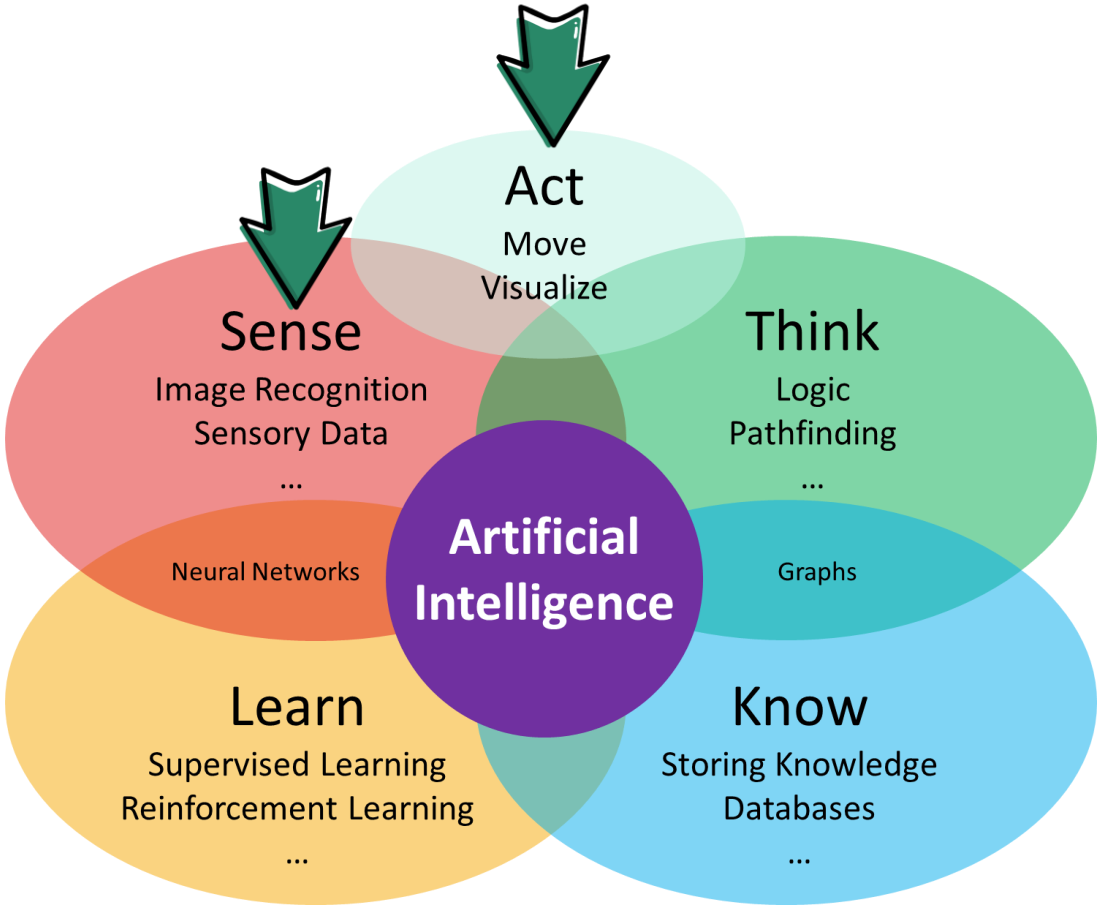

Act
Move
Visualize
Sense
Image Recognition
Sensory Data
...
Think
Logic
Pathfinding
...
Neural Networks
Artificial Intelligence
Graphs
Learn
Supervised Learning
Reinforcement Learning
...
Know
Storing Knowledge
Databases
...

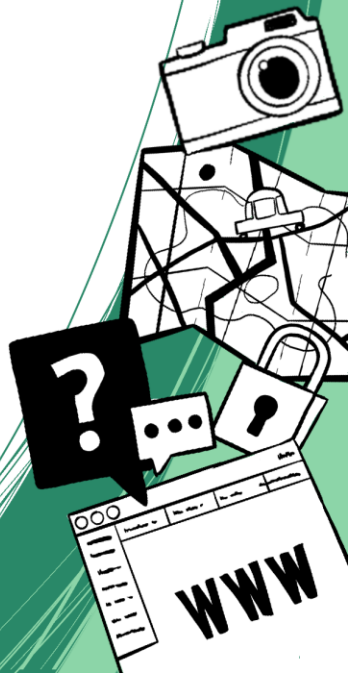

WWW

ENARIS

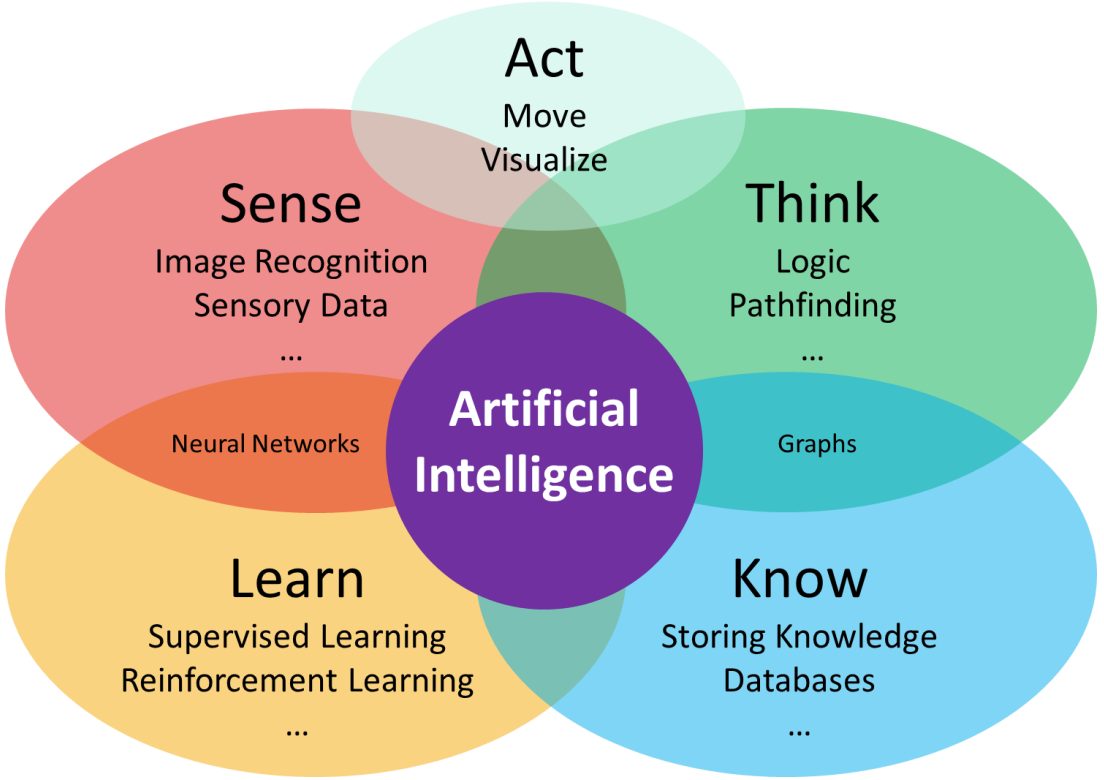
1. Toaster



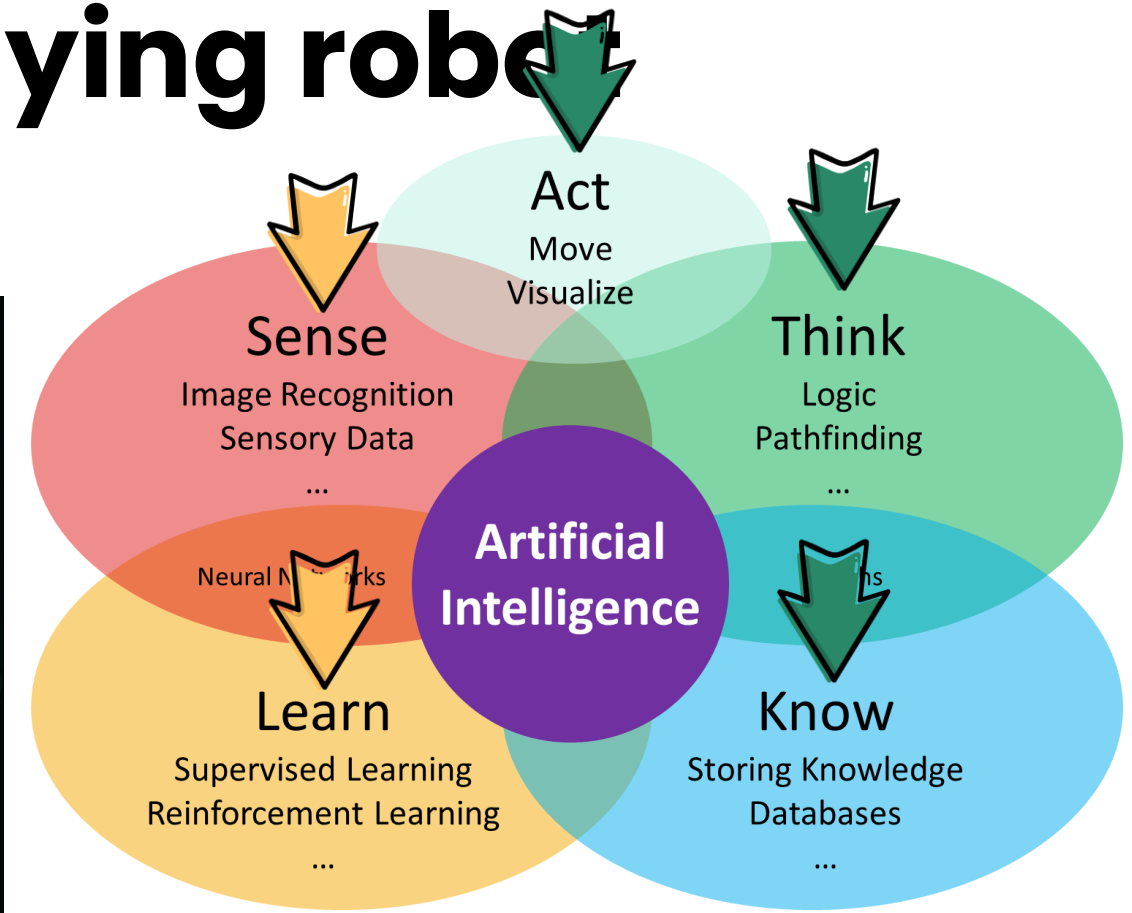




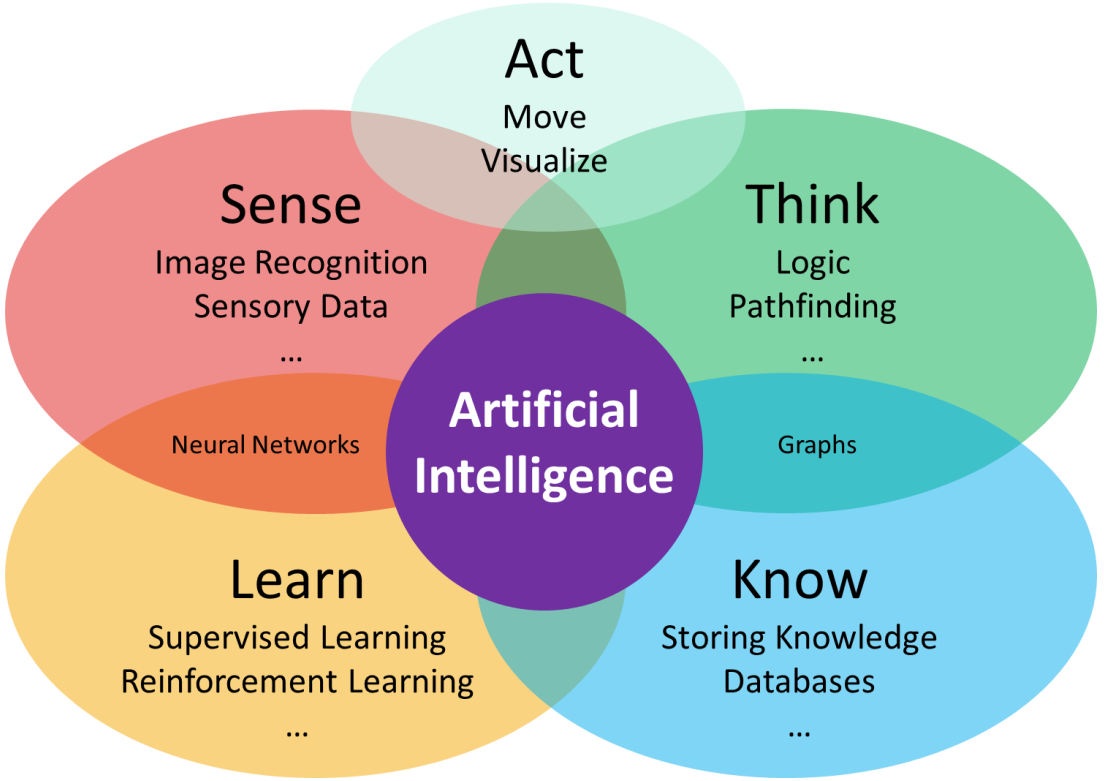
3. Chess playing robot



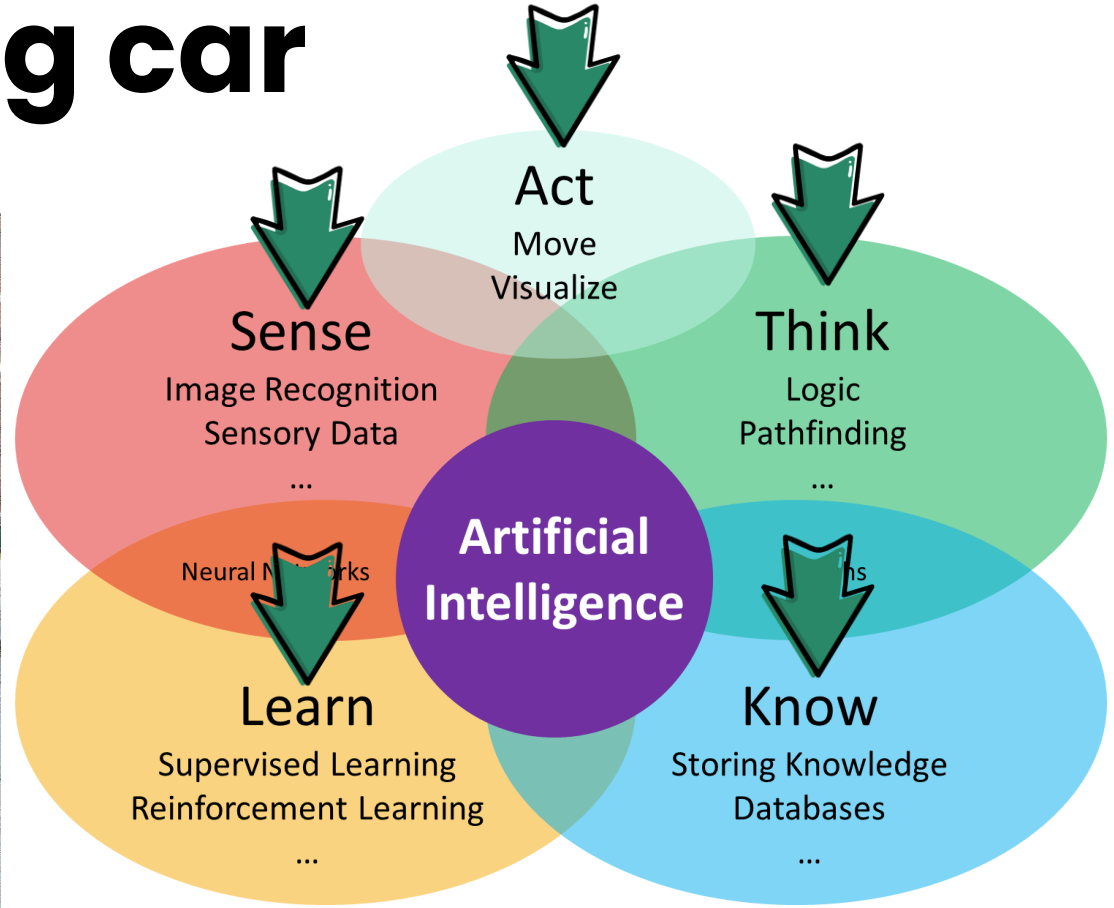
3. Chess playing robot



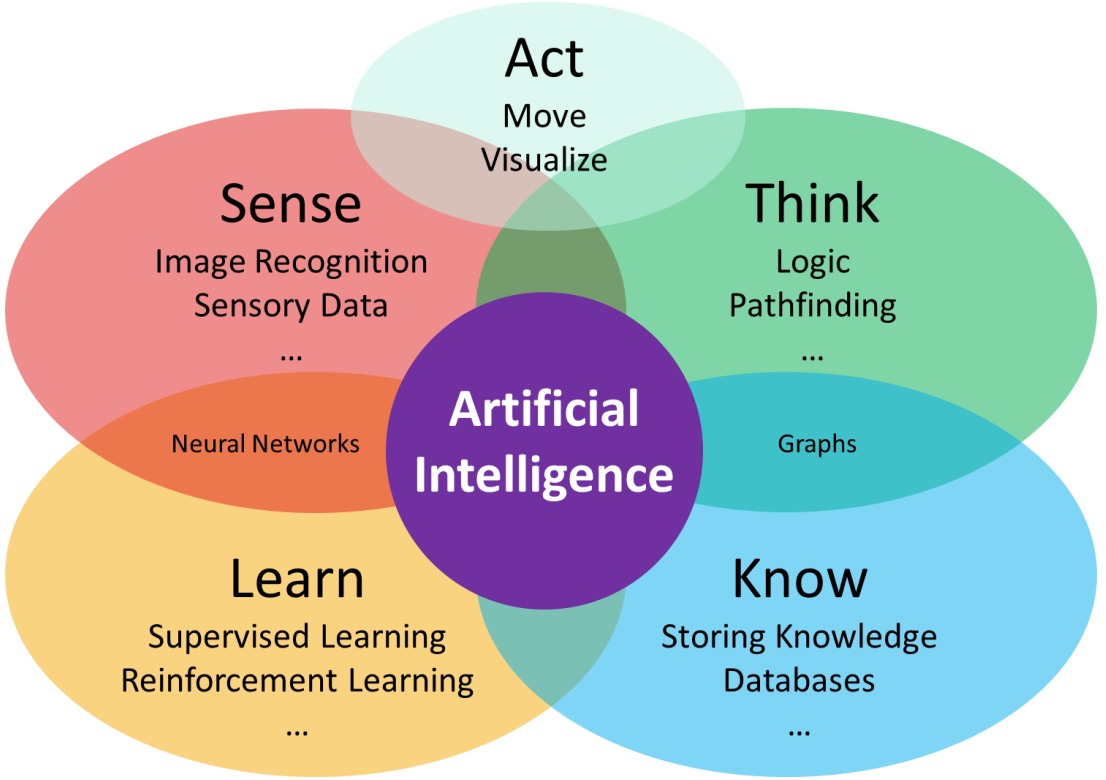
5. Self driving car

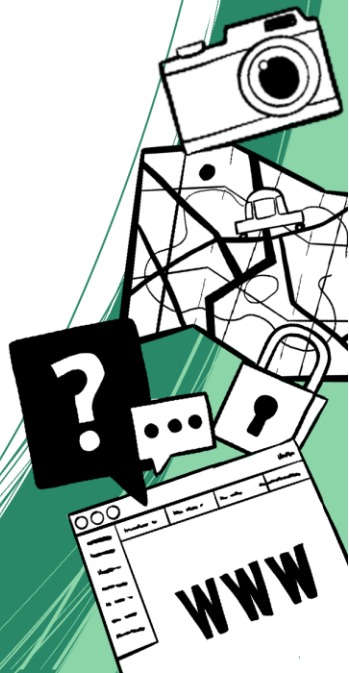


5. Self driving car

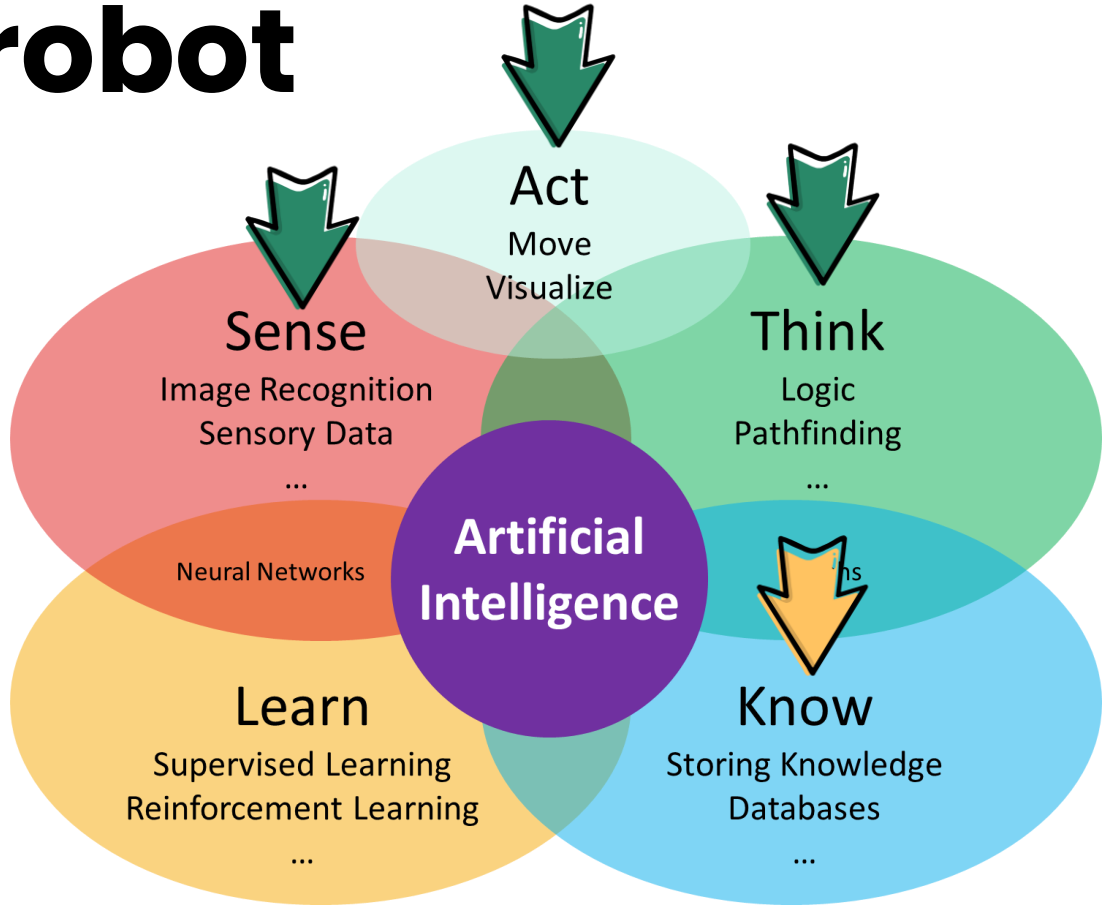


6. Cleaning robot





6. Cleaning robot



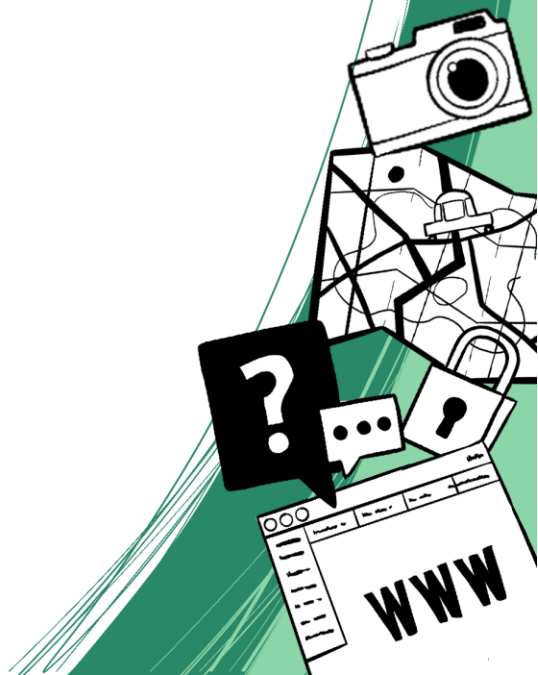
Map of AI

- There are **a lot of fields** in AI
  - Machine Learning is just one of them…
- Most systems **combine** multiple **fields**

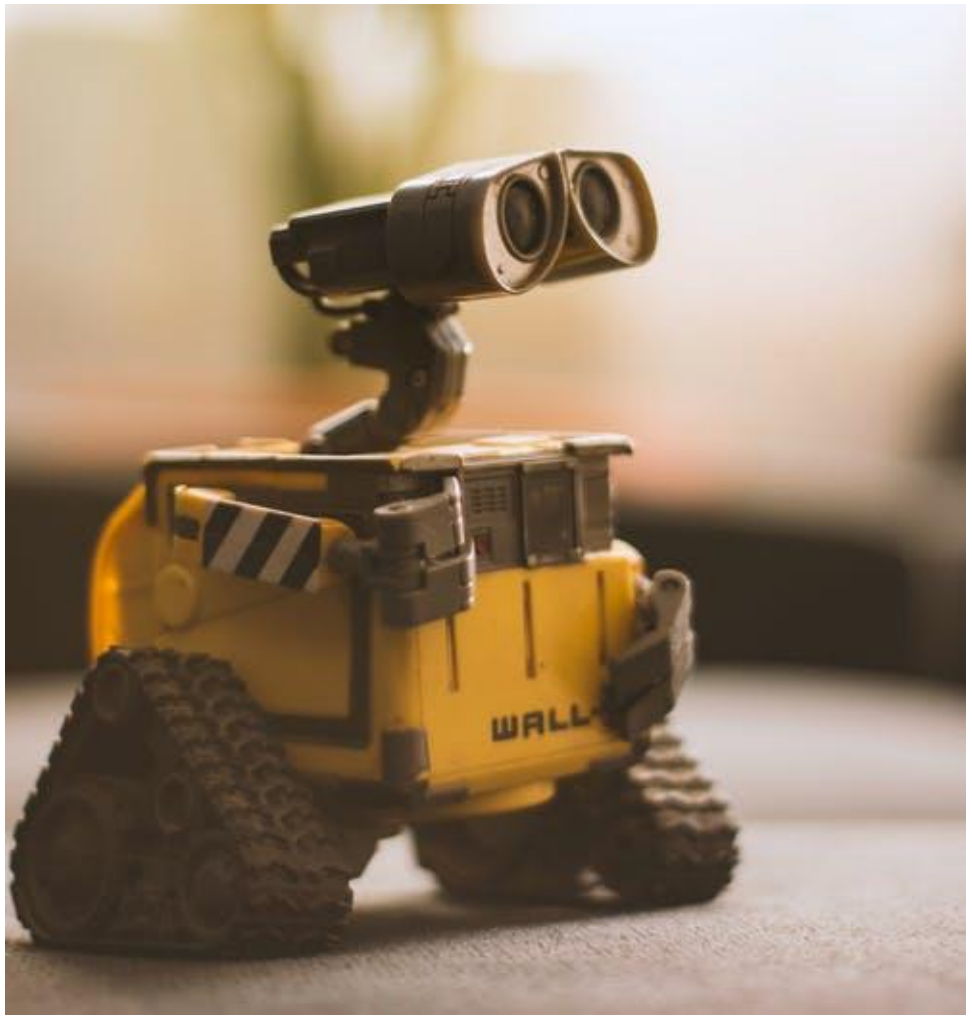
Possibilities and Limitations

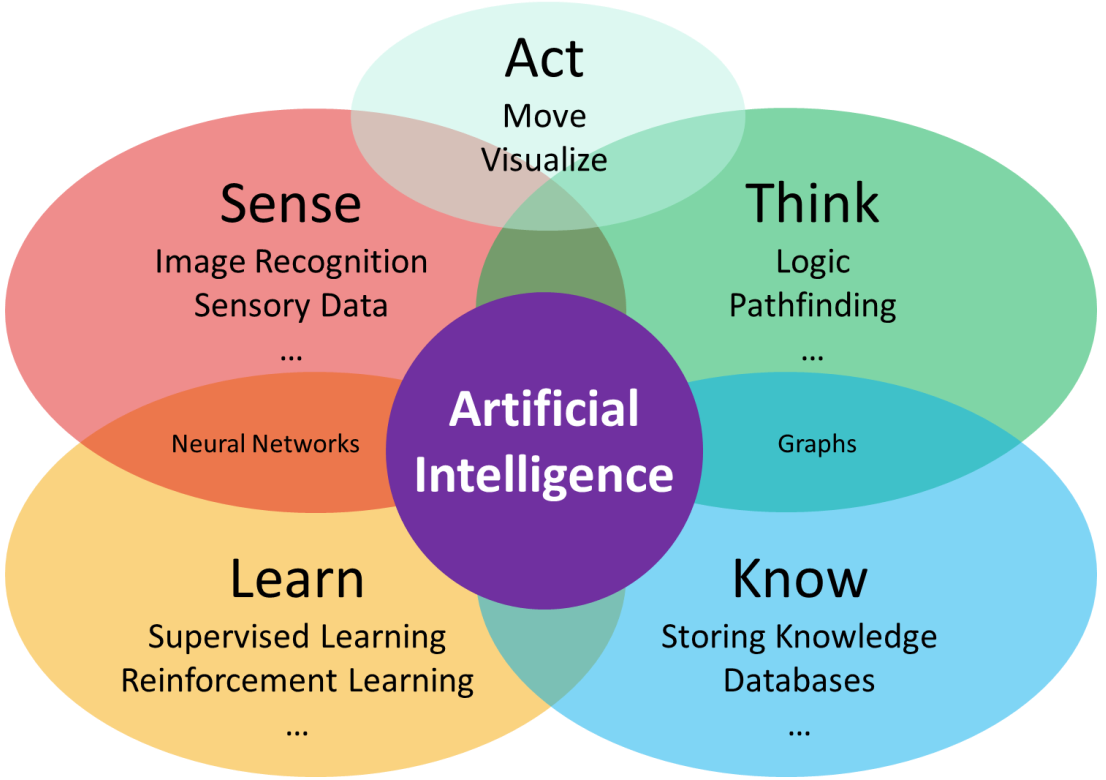
Video

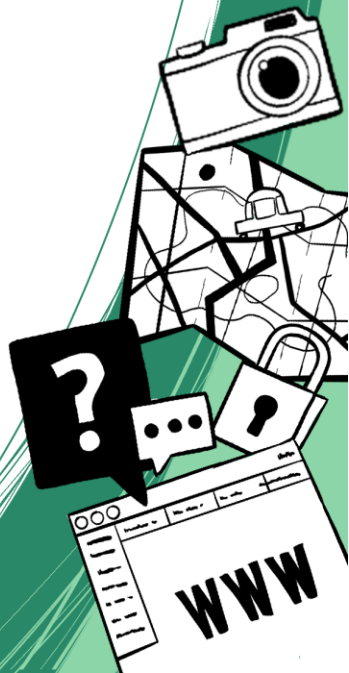
- EN: https://youtu.be/aIIq_wG9FNk
- DE: https://youtu.be/92P0-mKMq9I
- HU:



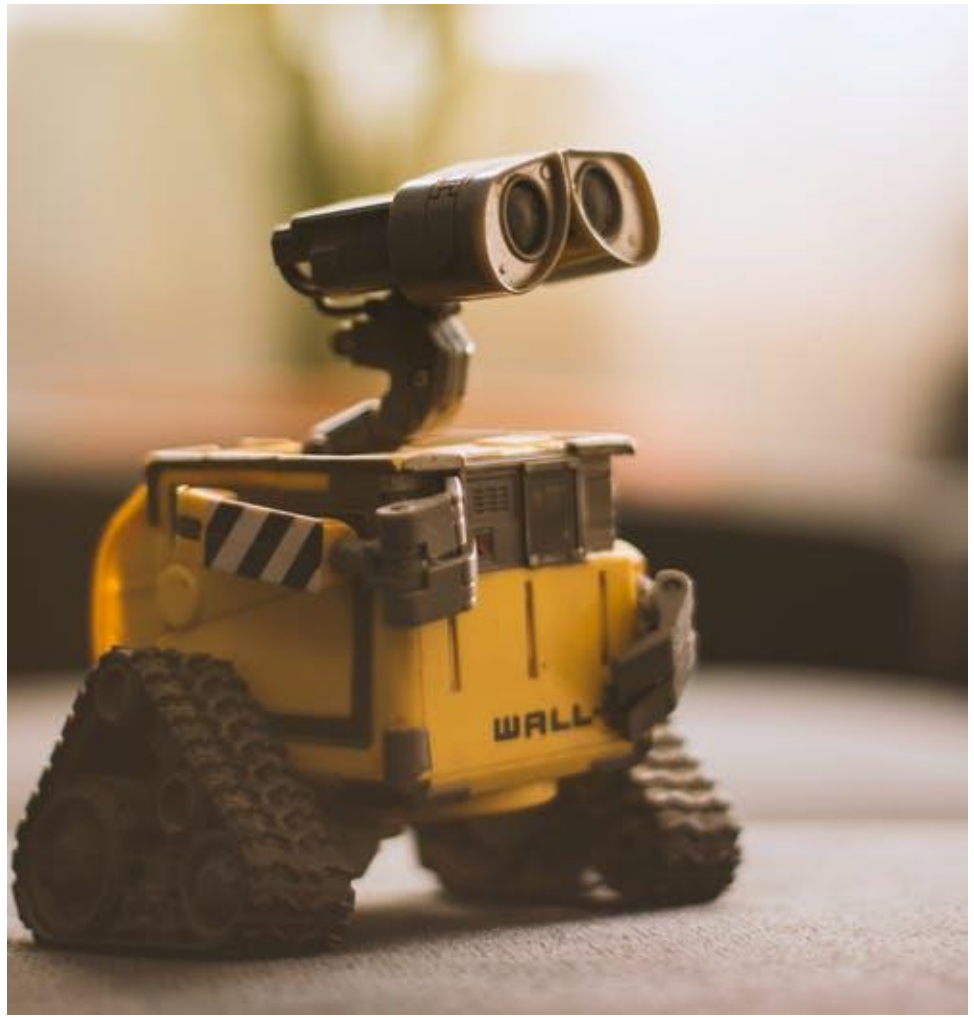
8. Earth-cleaning robot

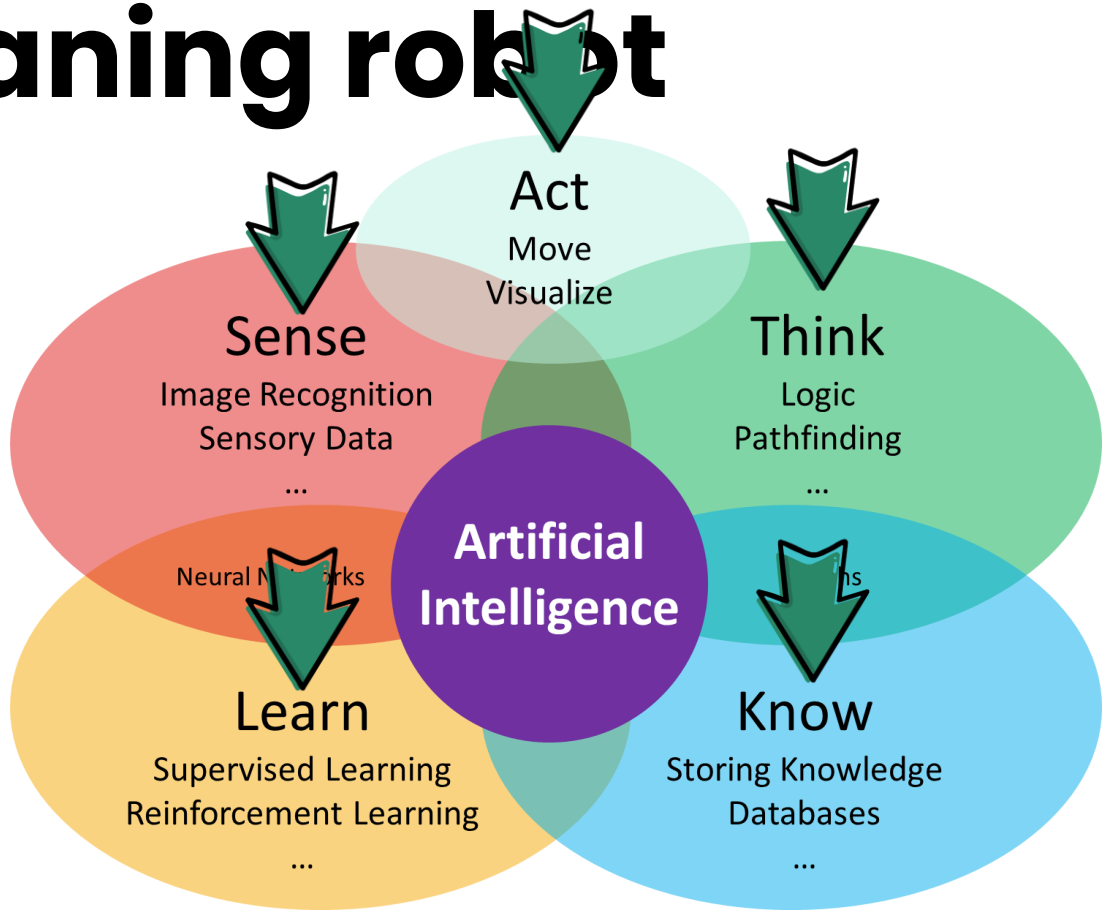


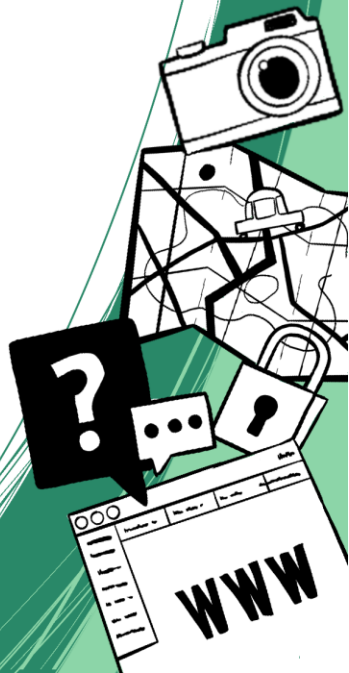




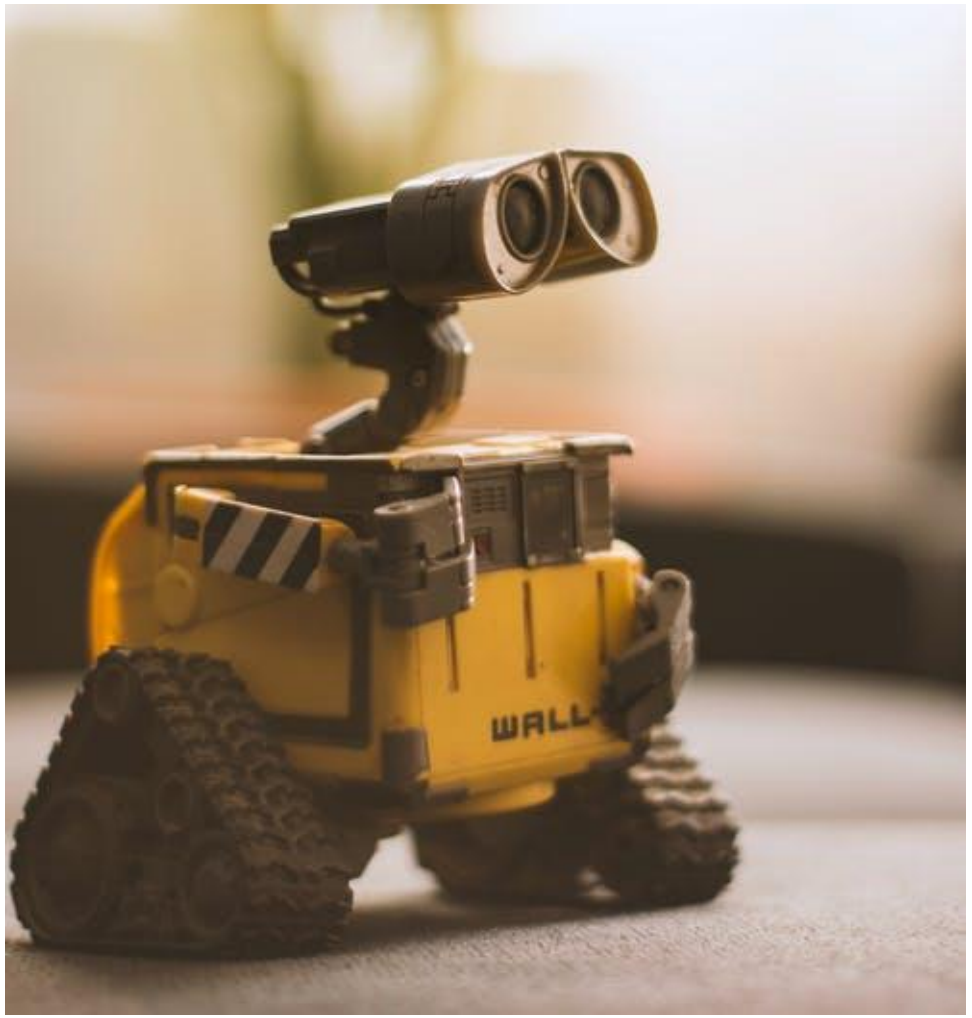
8. Earth-cleaning robot



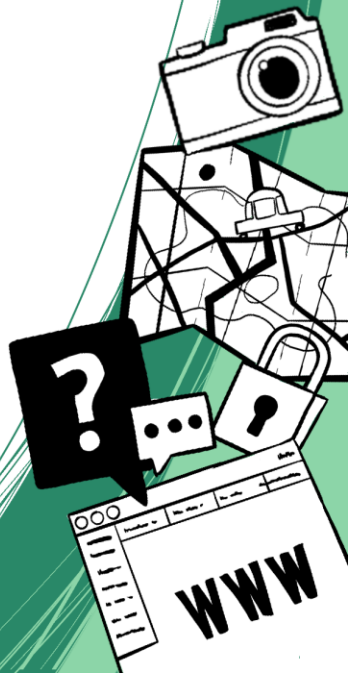




8. Earth-cleaning robot



What is the **difference** between **Wall-E** and the **other AI examples**?



Narrow vs general

- AI systems can be grouped in two categories
  - **Narrow AI**
    - System that can efficiently solve a specific task

Narrow vs general

- AI systems can be grouped in two categories
  - **Narrow AI**
    - System that can efficiently solve a specific task
  - **General AI**
    - System that can understand, reason and act successfully in the real world

Narrow vs general

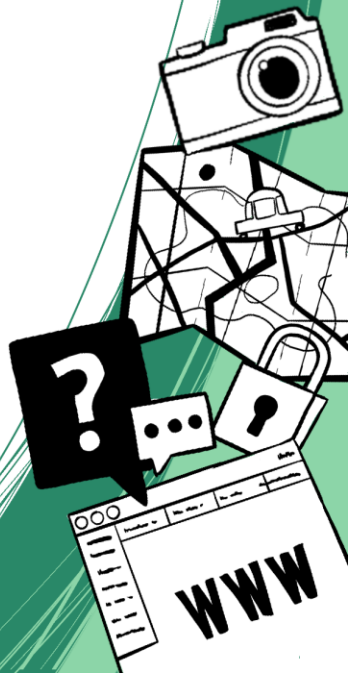
- AI systems can be grouped in two categories
  - **Narrow AI**
    - System that can efficiently solve a specific task
  - **General AI**
    - System that can understand, reason and act successfully in the real world
- **All** current AI systems are **narrow AIs**!

Narrow vs general

- AI systems can be grouped in two categories
  - **Narrow AI**
    - System that can efficiently solve a specific task
  - **General AI**
    - System that can understand, reason and act successfully in the real world
- **All** current AI systems are **narrow AIs**!
  - They are really good at a **specific task**!

Narrow vs general

- AI systems can be grouped in two categories
  - **Narrow AI**
    - System that can efficiently solve a specific task
  - **General AI**
    - System that can understand, reason and act successfully in the real world
- **All** current AI systems are **narrow AIs**!
  - They are really good at a **specific task**!
  - But they **don't understand** what they are doing…



Narrow vs general

- AI systems can be grouped in two categories
  - **Narrow AI**
    - System that can efficiently solve a specific task
  - **General AI**
    - System that can understand, reason and act successfully in the real world
- **All** current AI systems are **narrow AIs**!
  - They are really good at a **specific task**!
  - But they **don't understand** what they are doing…
- Most **movies** depict **general AIs**!

Narrow vs general

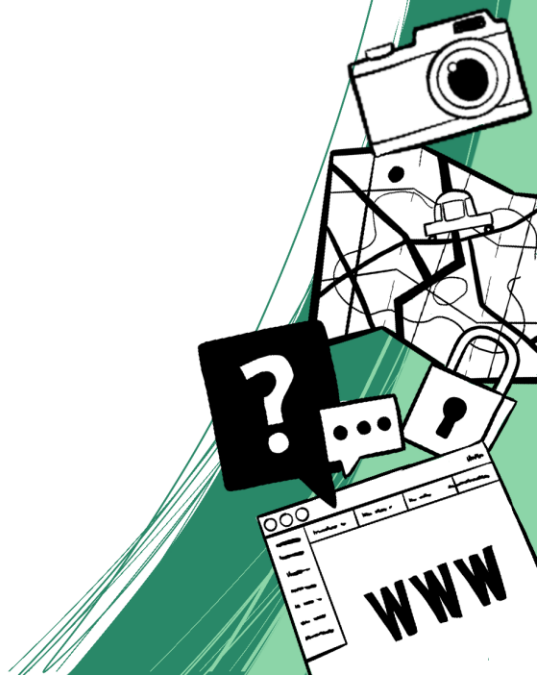
- AI systems can be grouped in two categories
  - **Narrow AI**
    - System that can efficiently solve a specific task
  - **General AI**
    - System that can understand, reason and act successfully in the real world
- **All** current AI systems are **narrow AIs**!
  - They are really good at a **specific task**!
  - But they **don't understand** what they are doing…
- Most **movies** depict **general AIs**!
  - Which we just **can't make** in the foreseeable future…

ENARIS

Algorithms

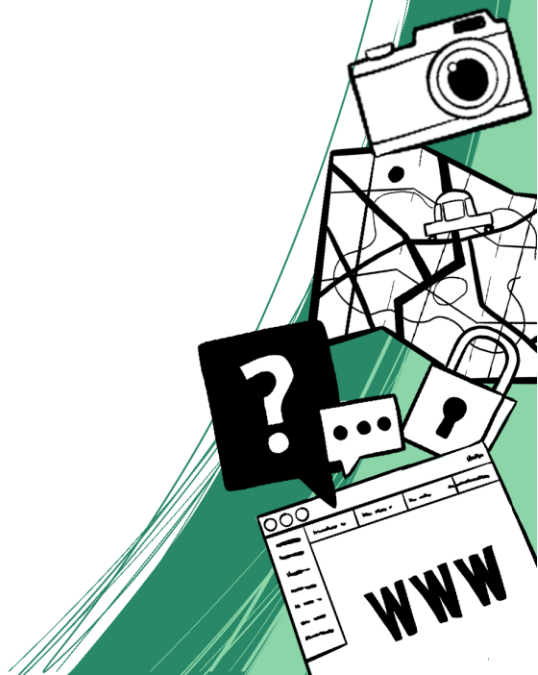
Algorithm

- **List of instructions** to solve a task



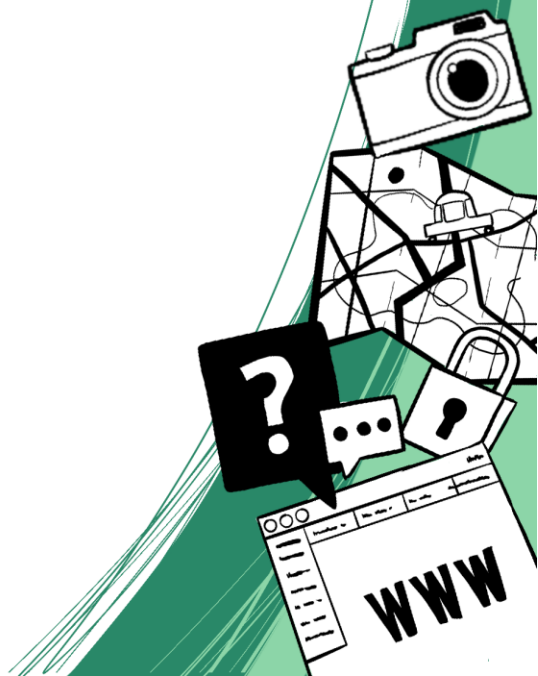
Algorithm

- **List of instructions** to solve a task
  - Like a cooking recipe or assembly instructions



Algorithm

- **List of instructions** to solve a task
  - Like a cooking recipe or assembly instructions
  - Has to be very precise, so it can not be misunderstood



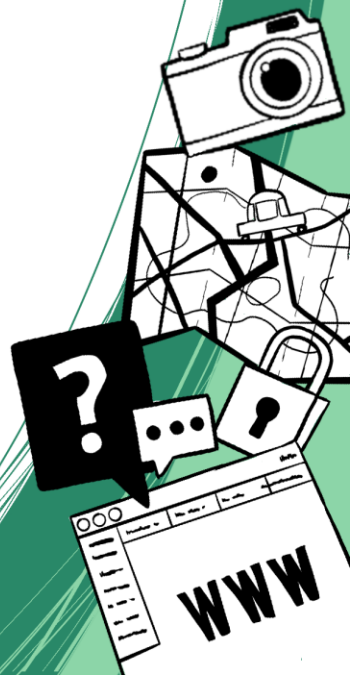
Algorithm

- **List of instructions** to solve a task
  - Like a cooking recipe or assembly instructions
  - Has to be very precise, so it can not be misunderstood

Try it yourself!

Data

- AI Algorithms usually work with **data**
  - Data is information that can be stored on a device
  - Like images, texts, numbers, relations, …



Data

- AI Algorithms usually work with **data**
  - Data is information that can be stored on a device
  - Like images, texts, numbers, relations, …
    - An image of a tree
    - The height of a person
    - A field of a board game
    - The name of an object
    - …

Can **you** find further **examples of data**?

Data

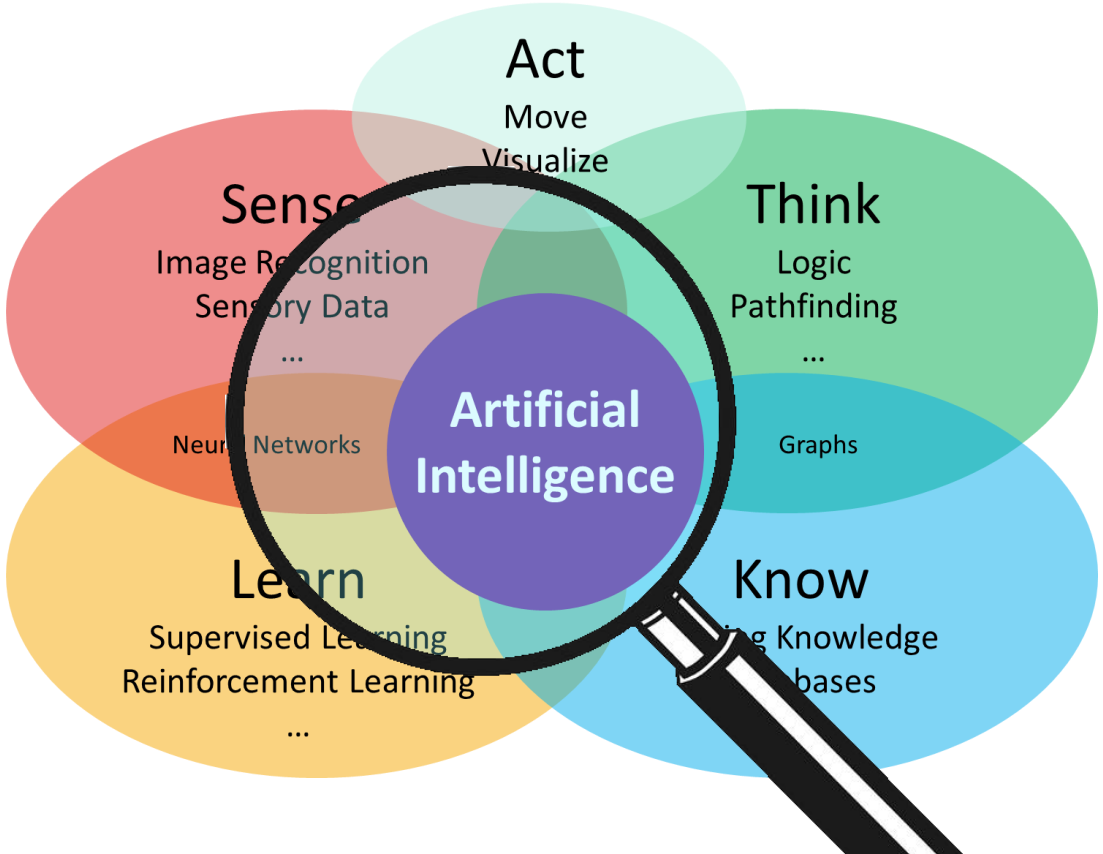
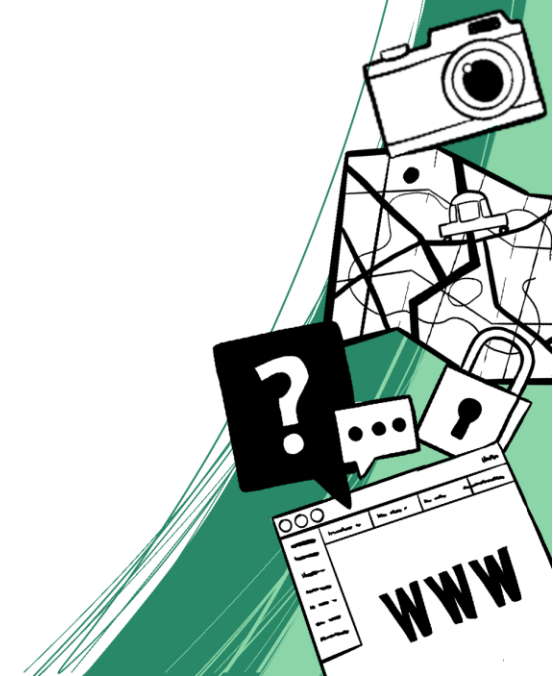
- AI Algorithms usually work with **data**
  - Data is information that can be stored on a device
  - Like images, texts, numbers, relations, …
    - An image of a tree
    - The height of a person
    - A field of a board game
    - The name of an object
    - …

Can **you** find further **examples of data**?

What was **data** in your **algorithm** example?

Questions?

01001000
01100101
01101100
01110000
00100001

Up next

Take a more in depth look into **how** some of these algorithms **actually work**!