

# Introduction to robotics

Robotics

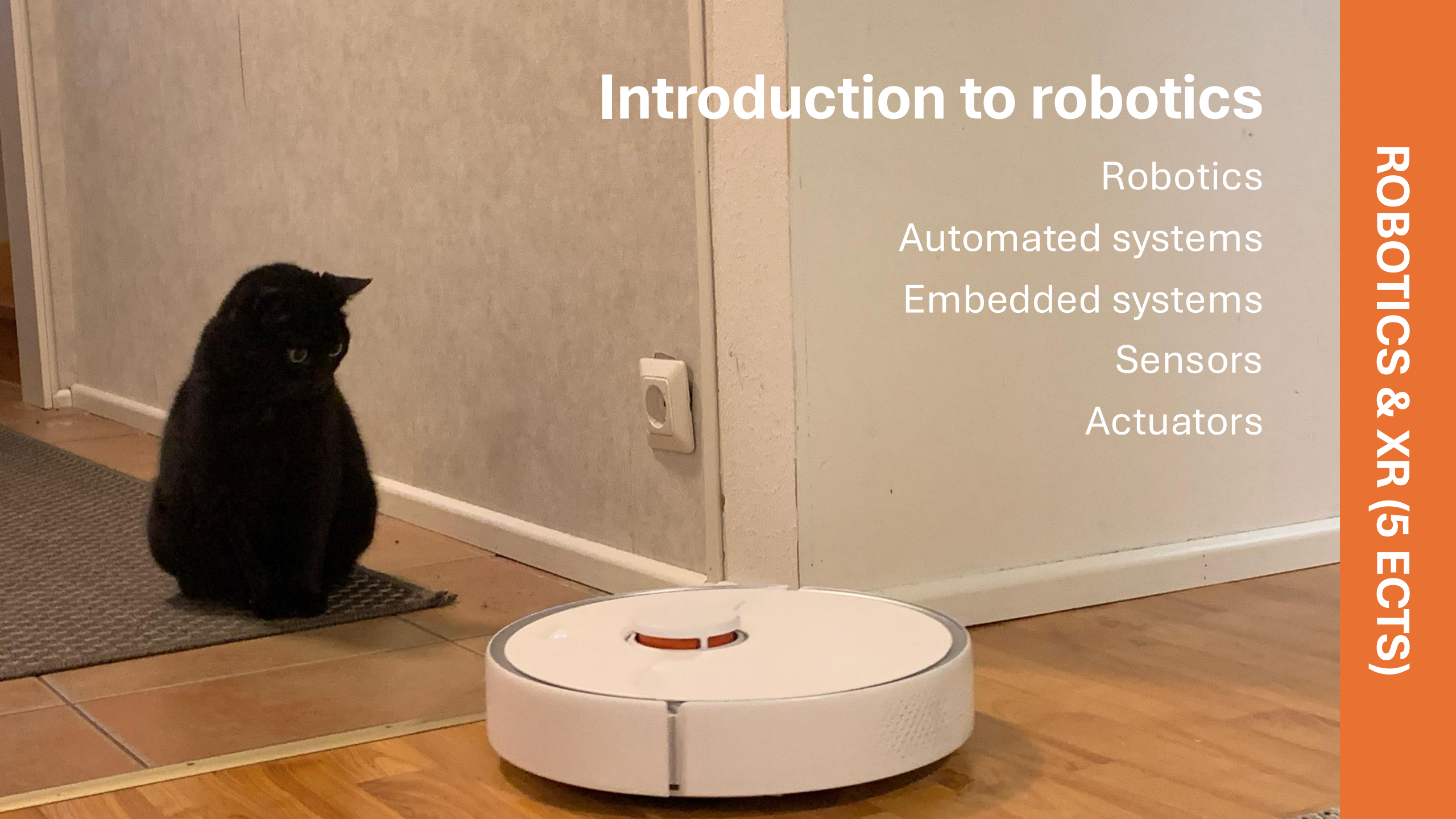
Automated systems

Embedded systems

Sensors

Actuators

**ROBOTICS & XR (5 ECTS)**



# Robotics

- "robota": hard work or slavery, worker in mechanical repetitive work
- Humankind has tried to create artificial intelligence since early days of its short history, for example *Golem* in Jewish folklore
- Robots have always been very popular in science fiction movies and popular culture
  - "Maschinen-Menschen", Metropolis (1927)
  - Robby the Robot, Forbidden Planet (1956)
  - T-101, Terminator (1984)
  - R2-D2, C-3PO, Star Wars (1977-20xx)

# Definition of robot?

- Mechanical device, that reacts to input from its surrounding and mimics in this way a living creature
- Autonomical function – no remote controlling
- Virtual robots, "bots"
- Exact definition for robots is more and more difficult
  - For example: In which point driving assistant features in a car turn the car to an independent robot that is capable act and make decisions on behalf of the driver?

# Three (or four) laws of robotics

*by Isaac Asimov in "I, Robot" in 1950*

- (0. A robot may not harm humanity, or, by inaction, allow humanity to come to harm.)
- 1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.
- 2. A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.
- 3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws.

# Three laws of robotics and ethics

Think (with your fellow students, if you can):

How the three laws of robotics should be applied for example in the case of self-driving robot cars. For example, should the AI of the car drive to mass of people or take the car off from the road (and potentially kill the driver), if there is no chance to stop in time.

- <http://moralmachine.mit.edu/>
- Lin, Patrick. Why ethics matters for autonomous cars.  
In: *Autonomous driving*. Springer, Berlin, Heidelberg, 2016. p. 69-85. <https://link.springer.com/book/10.1007/978-3-662-48847-8>
- Springer book "An Introduction to Ethics in Robotics and AI"  
<https://link.springer.com/book/10.1007/978-3-030-51110-4>

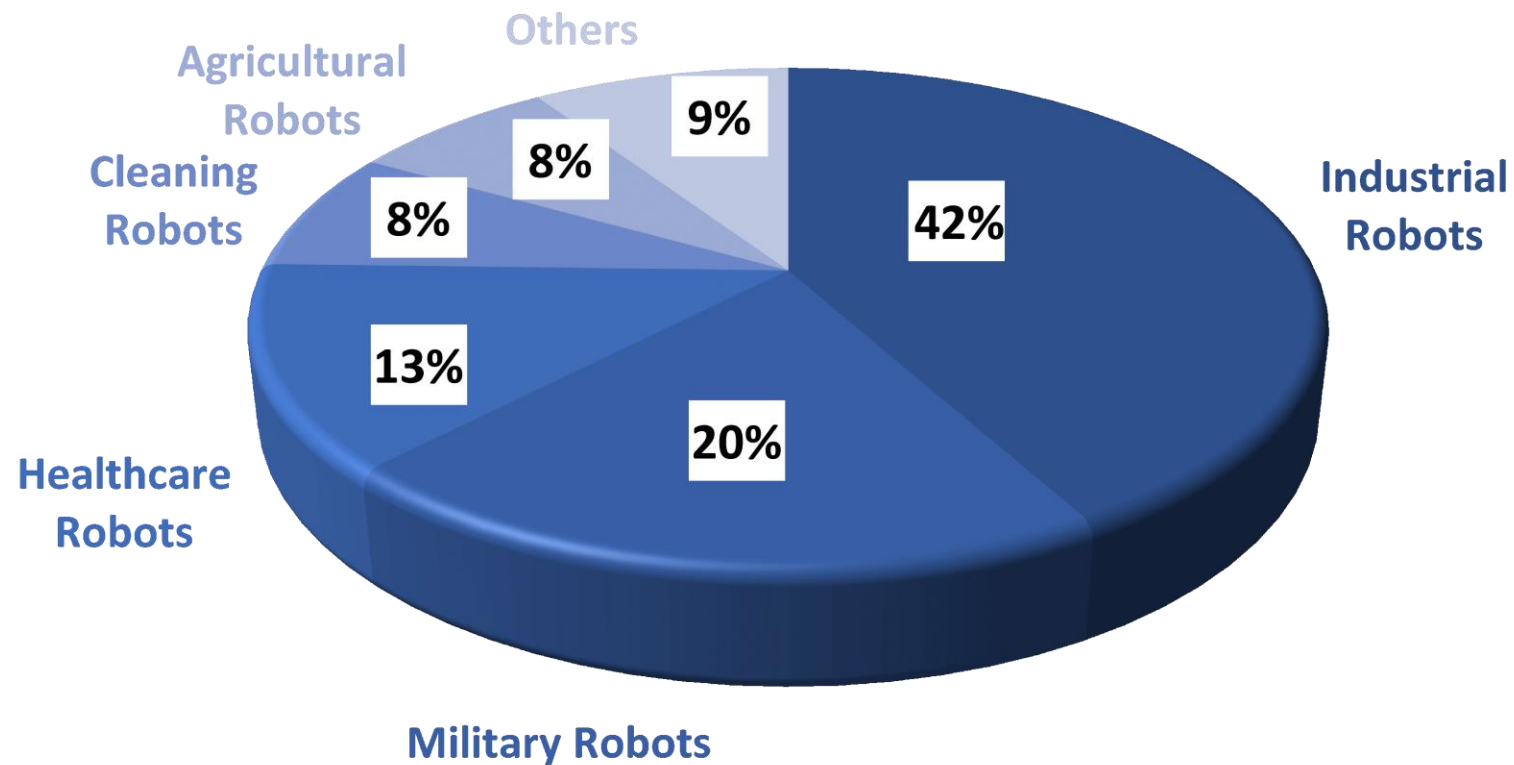


# Robotization and society

- A remarkable competitiveness factory in industrial market
- Governments and public bodies list robotics and intelligent automation as one of the key actions in the future economical growth
- Growth of business opportunities in robotics is not in industrial sector, but in healthcare, bio economy, supply chains, transportation, etc.
- Robotics economy is tens of billion USD / year (45-90 billion USD, depending on the source)

# Robotization in society

Revenue Share, 2021



Source: Strategic Market Research

# Robotization in society



Source: <https://www.benchmarkintl.com/insights/2024-robotics-industry-report/>