

## Lecture 01.01 Defining robots

What is a robot? Due to the wide variety of existing robots, it can be challenging to identify the gist of the term, but here are some I claim are essential:

mechanical	<b>mechanicality</b> A robot has a <i>mechanical presence</i> in an <i>environment</i> .
presence	<b>sensitivity</b> A robot can partially <i>sense</i> its environment.
environment	<b>potency</b> A robot can <i>act</i> on its environment.
sensing	<b>intelligence</b> A robot can act <i>intelligently</i> .
acting	<b>artificiality</b> A robot is designed by humans. <sup>1</sup>
intelligence	<b>autonomy</b> A robot is <i>autonomous</i> , acting at least partially without direct human intervention.
autonomous	

These are each *necessary* conditions for a device to be a robot. However, I claim they collectively are *sufficient* conditions. In other words, a device must have all these qualities to be a robot, and if it is missing any, it is not a robot. Although this definition of a robot may be flawed, or may change in the future, it gives us a useful device for discerning if a given device is a robot or not. Furthermore, it allows us to determine which qualities the device would need to have to be considered a robot.

### Example 01.01-1 Is it a robot?

Classify each of the following as robot or not-robot. If it is not a robot, list the missing qualities. Comment on ambiguities.

- A Roomba vacuum cleaner.
- A desktop computer.
- A home heating/cooling system.
- A toilet tank.
- A car.
- A cell phone.
- A simulation of a robot.
- A 3D printer.

<sup>1</sup>Or, at least, if it was designed by a robot, which was designed by a robot, etc.—the original robot must have been designed by a human.



We will explore the meaning of each of the qualities of a robot in the following lectures. For now, let's pause a moment to consider the "why" of

robotics.

### 01.01.1 Why robots

Why do we make robots? Reasons include:

**artificial life** **robots are cool** One motivating factor seems to be the awe we experience when creating something that appears life-like. In fact, creating *artificial life* has been one of the explicit goals of some roboticists. Other roboticists have been inspired by (biological) life to create more effective robots; this field is called *biomimicry*.

**biomimicry**

**biology is cool** A related reason to robot is that while we're creating artificial life and biomimetic robots, we frequently "reverse engineer" biological life, which yields a deeper grokking of biology. We can develop robots in service of biology.

**robots help make things we like** Robots help manufacture cars, airplanes, food, computers, cell phones, and many other things we like.

**robots do dangerous work** Instead of humans doing certain dangerous work, like cleaning up a toxic chemical spill, robots can take our places.

**robots do boring work** Especially in manufacturing, but also in household chores, robots can replace humans in work that is repetitive and boring. This has the potential to free up human time for activity we find more meaningful.

**robots can do precise work** Robot-assisted surgery, for instance, allows a human surgeon to guide a robot through a delicate procedure that requires mechanical precision beyond that of human capability.

**we like money** Robots give us economic advantages, which give us money. Under our estrangement in capitalism, we fetishize money not for its exchange value, but for itself.

**loss of human jobs**  
**concentration of wealth** We must address something here: despite its advantages, does not robot labor necessarily lead to the *loss of human jobs* and the further *concentration of wealth*? Yes and no. Yes, robot labor has in fact reduced human jobs and concentrated wealth, and it will continue to do so under the current world economic system (capitalism). No, this loss of human jobs is not necessary. Under a different economic system, robot labor could have a positive impact on human being.