

# Artificial Intelligence

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## **Artificial intelligence: computing like a machine, deciding like a person**

With computers that can recognize images, diagnose diseases and beat grandmasters at chess or world champions in the strategy game Go - the progress that has been made in the field of artificial intelligence over the last five years is huge.

Software is increasingly making automated decisions. In the machine learning sub-discipline, training data is used to enable algorithms to learn the right outcome in line with human specifications.

Artificial intelligence is based on the perception of information that can originate from sensors, images, language and text. From this information, the software draws its conclusions, learns, adjusts parameters accordingly and generates hypotheses. In the end, it reaches a decision on its own or makes a recommendation that human partners can use to underpin their own actions.

Developments in the field of artificial intelligence are expected to progress significantly in the future. There are two main reasons for this: on the one hand, technological progress and, on the other, the fact that the best algorithms are now available to everyone and everyone can improve them.

## **Deep learning - when machines learn to learn**

The accuracy of automated image recognition has leapt from about 70 percent in 2011 to over 95 percent, putting machines on a par with human beings. This tremendous progress is largely due to deep learning methods.

Here, complex algorithms are used in multilayered neural networks that learn, on the basis of huge volumes of data in a training phase, which patterns lead to which proposition, and can then apply these new findings to new images.

Two of the reasons this works so well are that computing speed continues to evolve exponentially and that graphics processing units are increasingly being used. These units - GPUs for short - are computer chips whose strength lies in the simultaneity of mathematical operations and are therefore highly suited to deep learning tasks.

### Hype or trend? What does artificial intelligence mean for Siemens?

Siemens has been active in this field for decades. Today, the company implements this technology in industrial applications:

- Complex image recognition as used, above all, for interpreting the results of computed tomography (CT) and magnetic resonance imaging (MRI).
- Autonomously learning, self-optimizing industrial systems such as those used in gas turbines and wind farms
- Accurate forecasts of copper prices and expected power grid capacity utilization.
- In addition, intensive work is being carried out on physical, autonomous systems for use in collaborative, adaptive, flexible manufacturing as part of Industrie 4.0.