Machine learning is the part of AI that helps machines learn to understand completely on their own by going through large amounts of data. Unlike pure programming where you're talking about the computer explicitly what it should do, algorithms are used that allow the computer to interpret and learn from the data it processes to then predict patterns. The more data and information the computer is exposed to, the smarter it becomes. Machine learning works similar to a child who sees a bird for the first time. The child needs to see some more examples of birds to see the difference between birds, dogs or cats.[[1]](#footnote-0)

For machines to learn from data, various algorithms are used to make sense of data that is passed to the machine. These algorithms fall into multiple categories, where each category groups algorithms depending on their similarities in how the machine is learning. These categories include, but are not limited to, regression-, regularization-, decision tree- and clustering algorithms.[[2]](#footnote-1)

There are three common learning styles which different training algorithms can fall into:

**Supervised learning** means that you have a data set where you already know the correct answer and want to create / learn a model that can then be used to make predictions from data where the correct answer is not known. Computers in this case learn about the same way as people by studying many examples of how something is done.[[3]](#footnote-2)

**Unsupervised learning** identifies patterns in data and tries to find similarities to divide data into categories. If the data is missing labels, it will not be able to train with supervised algorithms. Instead, using unattended learning, it is up to the algorithm itself to find patterns in the data to categorie it.[[4]](#footnote-3)

**Semi-supervised learning** is a mixture of supervised and unsupervised learning. Semi-supervised learning uses both labeled and unlabeled data to learn and understand the complete dataset. Since labeled data is more expensive than unlabeled data, a combination of slightly labeled data and a large amount of unlabeled data is used instead.[[5]](#footnote-4)

What is machine learning?

Machine learning is the part of AI that helps machines learn to understand completely on their own by going through large amounts of data. Unlike pure programming where you're talking about the computer exactly what it should do, algorithms are used that allow the computer to interpret and learn from the data it processes to then predict patterns.[[6]](#footnote-5)

Explain supervised learning.

Supervised learning means that you have a data set where you already know the correct answer and want to create / learn a model that can then be used to make predictions from data where the correct answer is not known.[[7]](#footnote-6)

Explain unsupervised learning.

Unsupervised learning identifies patterns in data and tries to find similarities to divide data into categories. If the data is missing labels, it will not be able to train with supervised algorithms. Instead, using unattended learning, it is up to the algorithm itself to find patterns in the data to categorie it.[[8]](#footnote-7)

What are the different use cases where machine learning algorithms can be used? [Lecture 6]

Some use cases where ML can be used:

• Fraud Detection  
• Face detection  
• Natural language processing  
• Spam detection

Explain semi-supervised learning.

Semi-supervised learning is a mixture of supervised and unsupervised learning. Semi-supervised learning uses both labeled and unlabeled data to learn and understand the complete dataset. Since labeled data is more expensive than unlabeled data, a combination of slightly labeled data and a large amount of unlabeled data is used instead.[[9]](#footnote-8)

Explain how a regression algorithm works and which supervised category it falls into (supervised, semi-supervised or unsupervised)[[10]](#footnote-9)

Regression is used to find a correlation between values in, for example, housing prices. The algorithm tries to find the most suitable formula for representing the house price - for example using a polynomial function, price = c1 + area \* c2 + area^2 \* c3, where the algorithm tries to figure out c1, c2 and c3 for some given house prices. By testing mathematical model best suits the data that is given, the algorithm learns how to predict a new houses price, depending on the calculated values for c1, c2 and c3 and the area of the new house. This algorithm is supervised, since the prices have to made sure to be accurate, it cannot be assumed that the algorithm will choose the right formula, which may end up giving an inaccurate prediction.

Explain reinforcement learning[[11]](#footnote-10) [[12]](#footnote-11)

Reinforcement learning is rewarding the AI for performing a correct operation or choice, while punishing the wrong choice or operation. For example, in a pacman game: *“from pixel data an agent might be given a numeric reward for the result of a unit of travel: 0 for empty space, 1 for pellets, 2 for fruit, 3 for a power pellet, 4 for a ghost post-power pellet, 5 for collecting all pellets and completing a level but being deducted 5 points for collision with a ghost.”* [11]

What are neural networks?[[13]](#footnote-12) [[14]](#footnote-13)

*“A neural network is a programming model that simulates the brain” [[15]](#footnote-14).* In a neural network, neurons are usually fed a lot of data along with answers (input and correct output). An example could be feeding images of actors, where the data says which image is which actor, if the image “not actor” or “not human”, and by going through lots of data and recognizing patterns, it can then predict future images and determine if they are or aren’t actors by having learnt from its previous data.

What is deep learning? [13]

Deep learning extends upon neural networks, where a large neural networks is fed massive amounts of data, resulting in greater results and which is also what has made artificial intelligence make a giant leap in the fields of speech recognition and computer vision.

What is AlphaGo? [13]

An AI developed by Google that, back in 2016, defeated a Grandmaster in the game game Go, which wasn’t expected until 2026. In go, there are up to 200 moves each turn, compared to chess where there are 20. This makes it extremely complex to calculate the most efficient move on each turn, which is what makes this feat so significant. Instead of calculating all possible moves, the AI developed by Google was fed data from 30 million games of Go by human players, and by feeding it into a deep learning neural network. In addition, the AI was taught by playing itself, making it even better at the game. By playing against the AI, the Go players have said that they are now re-evaluating what they know about the game and testing out new moves that the AI used against them when playing. [[16]](#footnote-15)

1. <https://www.mathworks.com/discovery/machine-learning.html> [↑](#footnote-ref-0)
2. <https://machinelearningmastery.com/a-tour-of-machine-learning-algorithms/> [↑](#footnote-ref-1)
3. <https://www.mathworks.com/discovery/supervised-learning.html> [↑](#footnote-ref-2)
4. <https://www.mathworks.com/discovery/unsupervised-learning.html?s_tid=srchtitle> [↑](#footnote-ref-3)
5. <https://www.datascience.com/blog/what-is-semi-supervised-learning> [↑](#footnote-ref-4)
6. <https://www.mathworks.com/discovery/machine-learning.html> [↑](#footnote-ref-5)
7. <https://www.mathworks.com/discovery/supervised-learning.html> [↑](#footnote-ref-6)
8. <https://www.mathworks.com/discovery/unsupervised-learning.html?s_tid=srchtitle> [↑](#footnote-ref-7)
9. <https://www.datascience.com/blog/what-is-semi-supervised-learning> [↑](#footnote-ref-8)
10. <https://machinelearningmastery.com/a-tour-of-machine-learning-algorithms/> [↑](#footnote-ref-9)
11. <https://searchenterpriseai.techtarget.com/definition/reinforcement-learning> [↑](#footnote-ref-10)
12. <https://www.sas.com/en_us/insights/analytics/machine-learning.html> [↑](#footnote-ref-11)
13. <https://www.zdnet.com/article/what-is-machine-learning-everything-you-need-to-know/> [↑](#footnote-ref-12)
14. <https://searchenterpriseai.techtarget.com/definition/neural-network> [↑](#footnote-ref-13)
15. <https://news.codecademy.com/what-are-neural-networks/> [↑](#footnote-ref-14)
16. <https://www.zdnet.com/article/googles-alphago-retires-after-beating-chinese-go-champion/> [↑](#footnote-ref-15)