

# Introduction to neural networks

Machine learning

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- 2 Machine learning tasks
- 3 Types of machine learning

## Machine Learning

A field of study that gives computers the ability to learn without being explicitly programmed <sup>a</sup>

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<sup>a</sup>Arthur Samuel, 1959

## Learning

An agent is learning if it improves its performance on future tasks after making observations about the world. <sup>a</sup>

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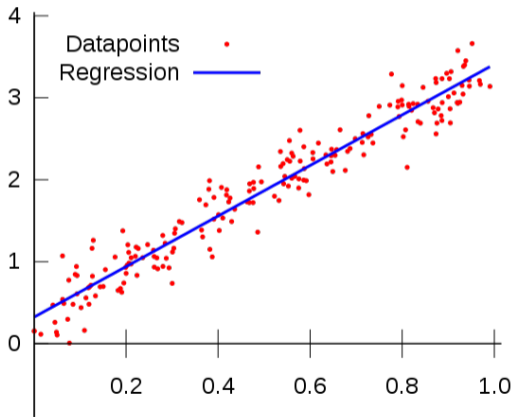
<sup>a</sup>Russell and Norvig

# Machine Learning in Artificial Intelligence <sup>1</sup>

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<sup>1</sup>Goodfellow, I., Bengio, Y., and Courville, A. (2016). Deep learning. MIT press.

**Regression.** Finds a function that relates the input to a continuous codomain.



Classification. Assigns a label to a given input. The set of classes is predefined.

Clustering. Automatically groups the inputs according to their features. The number of groups may be unknown.



Dimensionality reduction. Describes an entity with less features.

Generative modeling. To create new instances from a distribution.

Depending on how machines learn:

Supervised Learning. The machine learns from labeled data.

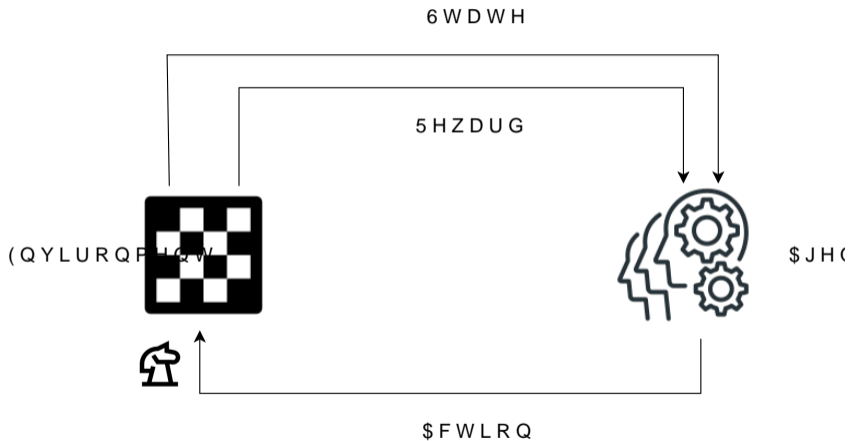
Un-supervised Learning. The machine tries to discover the structure of input data without labels.

Reinforcement Learning. The machine interacts with the environment improving its actions.

# Supervised Learning

# Unsupervised Learning

# Reinforcement Learning



# Neural Networks in Artificial Intelligence <sup>2</sup>

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<sup>2</sup>Goodfellow, I., Bengio, Y., and Courville, A. (2016). Deep learning. MIT press.

Sections 18.1 and 18.2 fom *Learning from examples* chapter. Russell and Norvig.  
Section 5.1 *Learning Algorithms*. Goodfellow et al.



<https://www.topbots.com/ai-research-generative-adversarial-network-images/>

<https://neptune.ai/blog/dimensionality-reduction>

<https://www.kaggle.com/c/dogs-vs-cats>

[https://training.galaxyproject.org/archive/2022-08-01/topics/statistics/tutorials/clustering\\_machinelearning/tutorial.html](https://training.galaxyproject.org/archive/2022-08-01/topics/statistics/tutorials/clustering_machinelearning/tutorial.html)

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