

Machine learning basics

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Machine learning

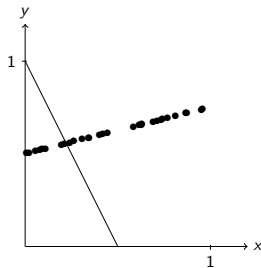
Machine learning (ML) is a subfield of artificial intelligence.

Intuitively We want to *learn from* and *make predictions on* data.

Technically We want to update the parameters of a model to make it describe our training data as well (defined by a *loss function*) as possible.

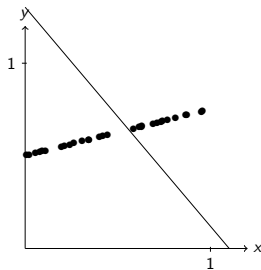
Model example

Linear regression



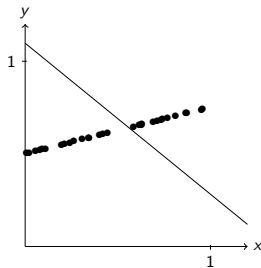
Model example

Linear regression



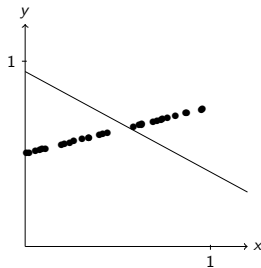
Model example

Linear regression



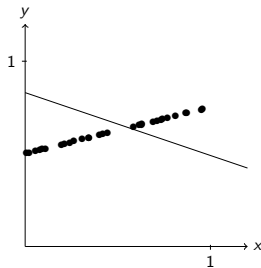
Model example

Linear regression



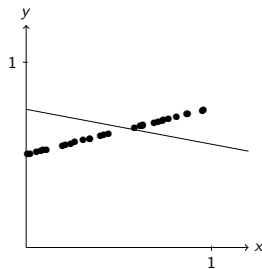
Model example

Linear regression



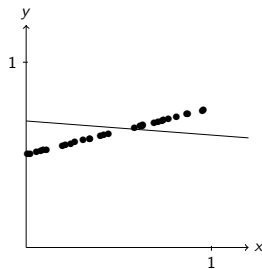
Model example

Linear regression



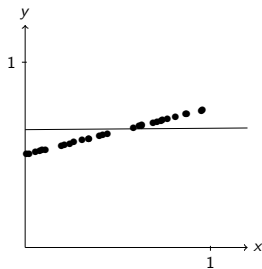
Model example

Linear regression



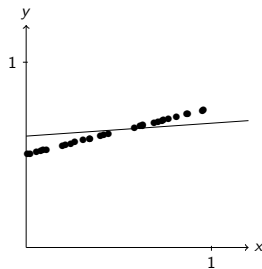
Model example

Linear regression



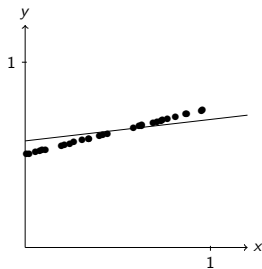
Model example

Linear regression



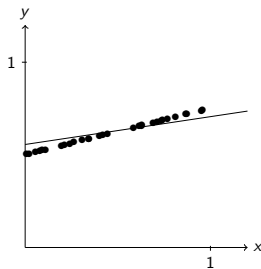
Model example

Linear regression



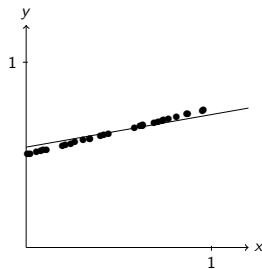
Model example

Linear regression



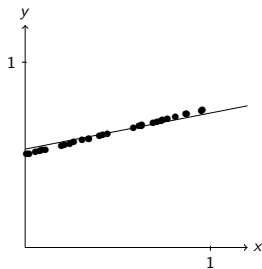
Model example

Linear regression



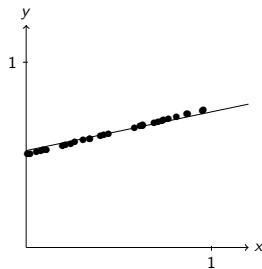
Model example

Linear regression



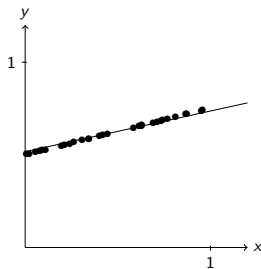
Model example

Linear regression



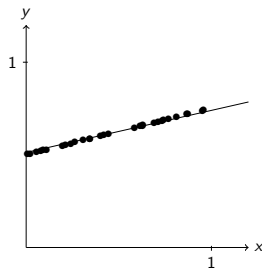
Model example

Linear regression



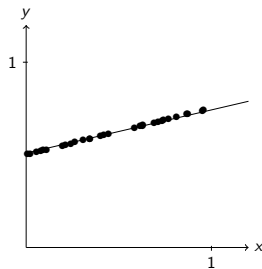
Model example

Linear regression



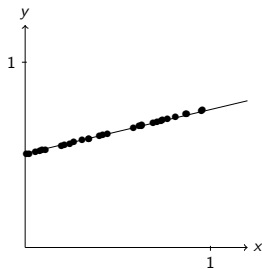
Model example

Linear regression



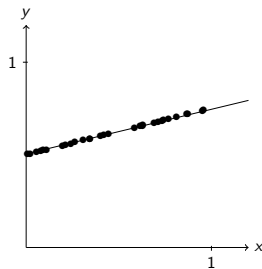
Model example

Linear regression



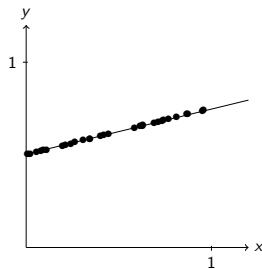
Model example

Linear regression



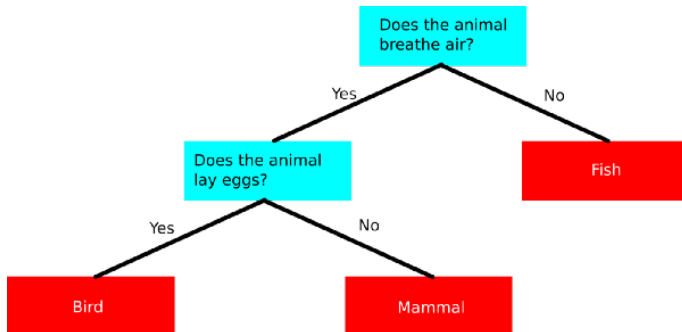
Model example

Linear regression



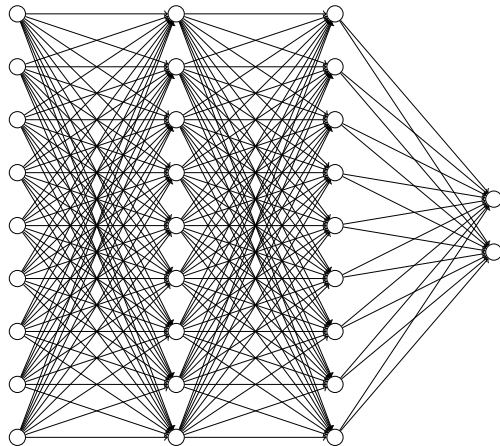
Model example

Decision tree



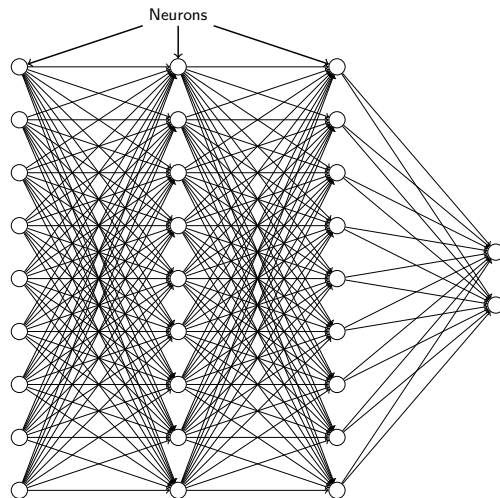
Model example

Neural network (deep learning)



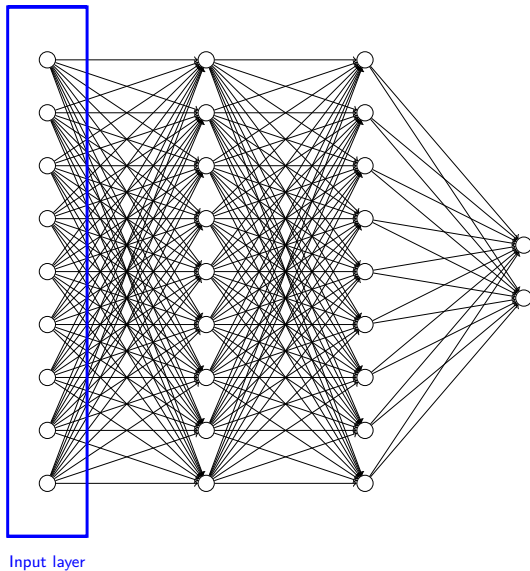
Model example

Neural network (deep learning)



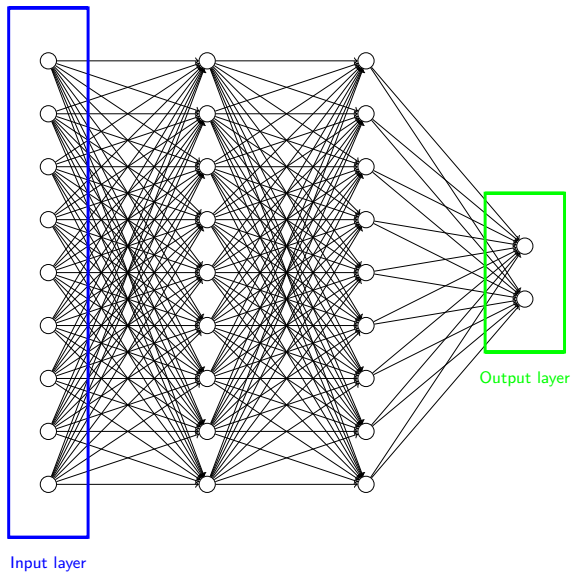
Model example

Neural network (deep learning)



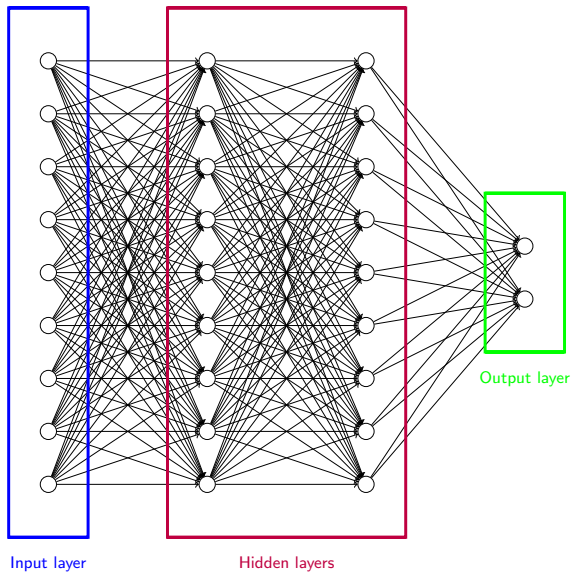
Model example

Neural network (deep learning)



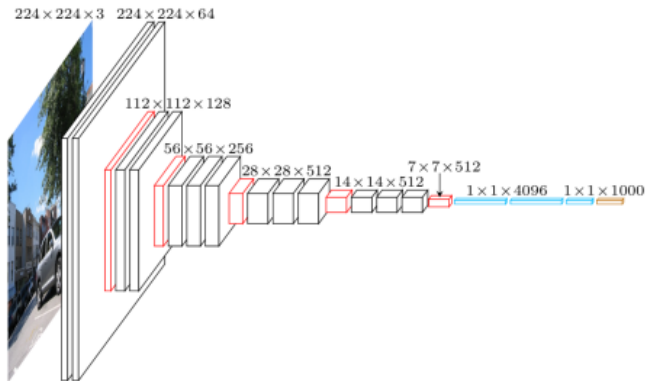
Model example

Neural network (deep learning)



Deep learning architecture

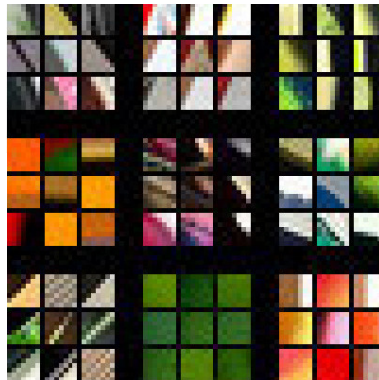
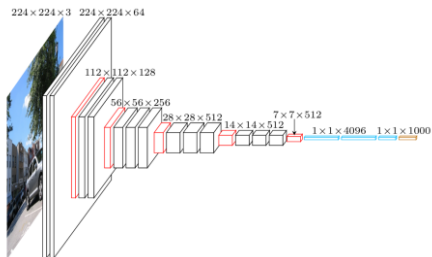
Image recognition (VGG 16)



Deep learning architecture

Hierarchized pattern recognition

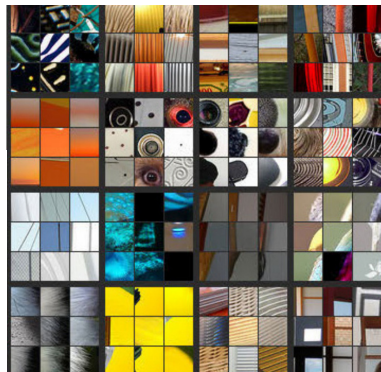
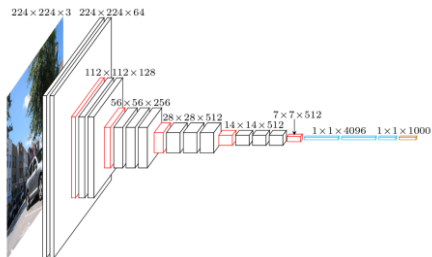
Layer 1



Deep learning architecture

Hierarchized pattern recognition

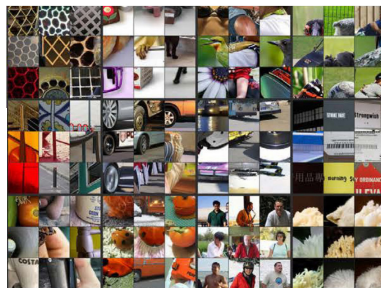
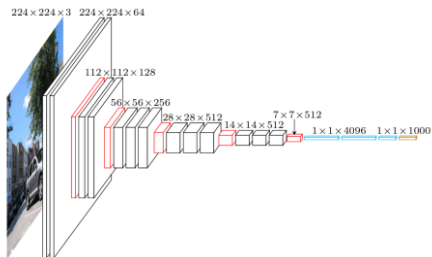
Layer 2



Deep learning architecture

Hierarchized pattern recognition

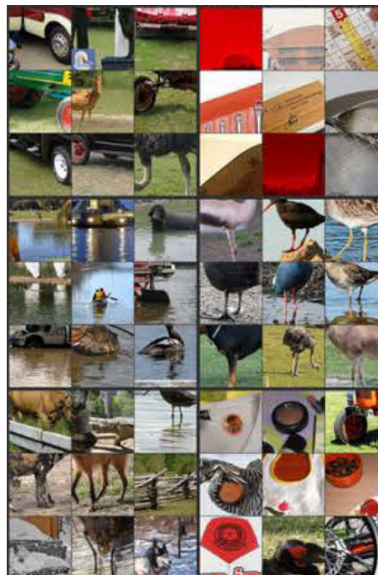
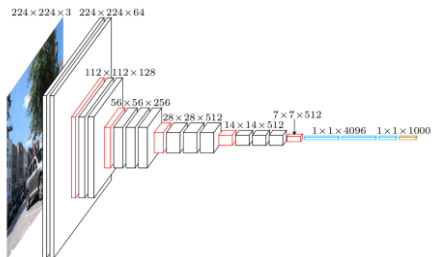
Layer 3



Deep learning architecture

Hierarchized pattern recognition

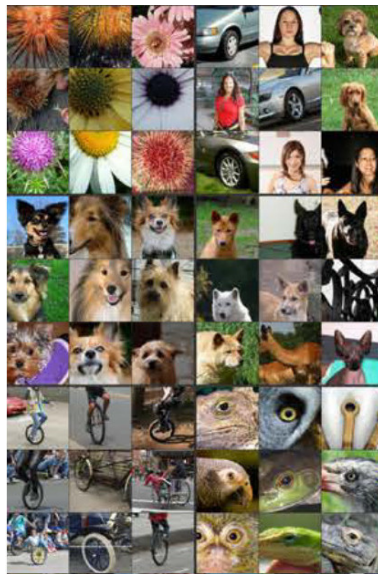
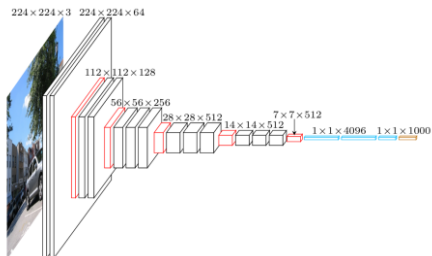
Layer 4



Deep learning architecture

Hierarchized pattern recognition

Layer 5



Application examples

Supervised learning

- Regression

Polynomial $(x, y, z) \rightarrow f(x, y, z)$

House price $(\text{surface, nb rooms, city}) \rightarrow \text{price}$

- Classification

Image classification $\text{pixel values} \rightarrow \text{cat or dog}$

Text classification $\text{list of words} \rightarrow \text{spam or valid email}$