PROJECT ML

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Machine Learning Methods
Group 5

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1 Introduction

What is this paper for? What are the main goals?

E.g. this is for ourself. We want to build an overview about the common algorithms, how they work and their advantages/disadvatages.

2 What is ML?

First some words about ML. Maybe from Lotz, first chapter? Next we could use this graphic to visualize the topic.

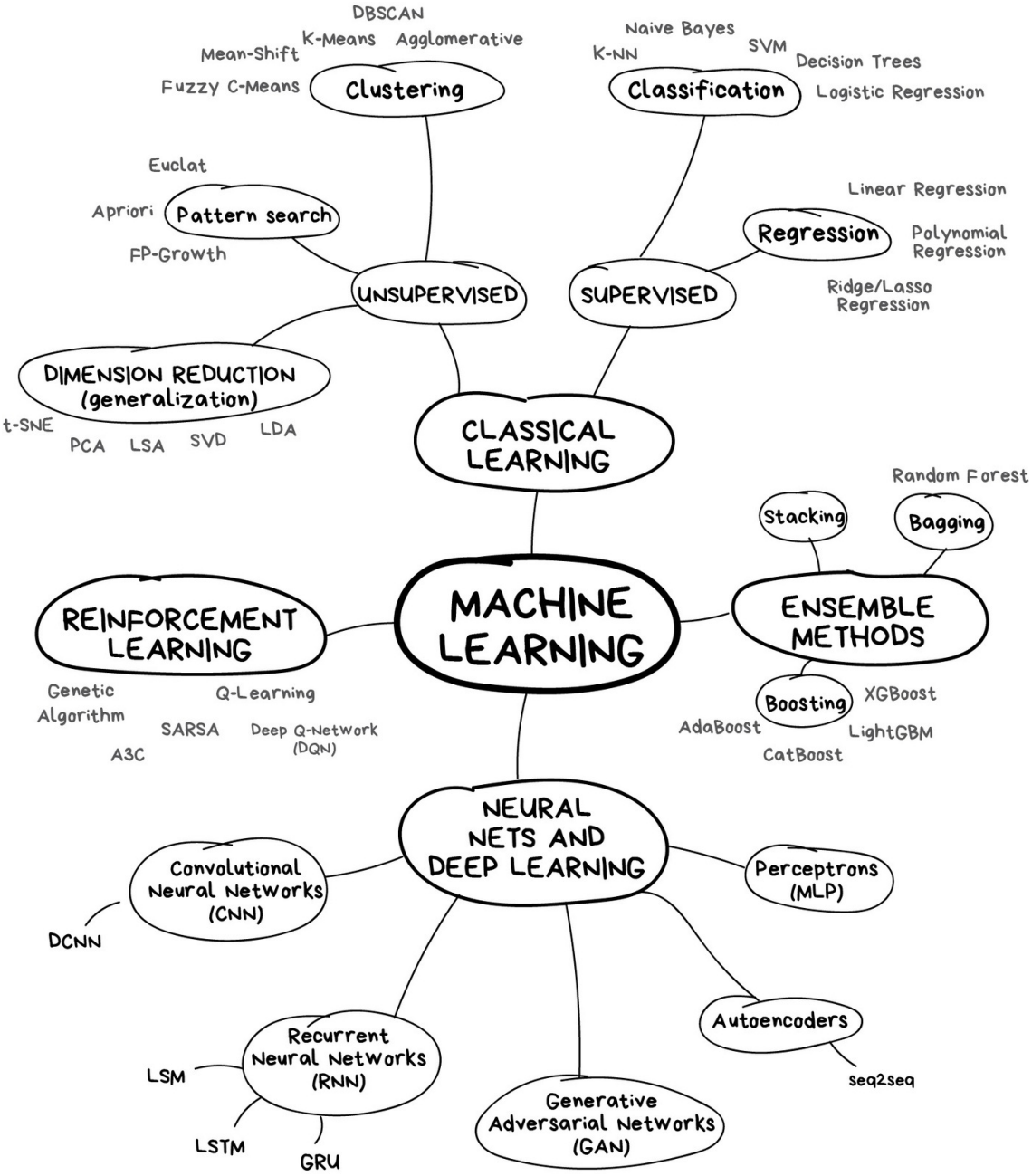

Figure 1: ML-Overview

Finally i would suggest to finish with a Table.

I would structure it like: Algorithm, Main Idea(in like 3-5 sentences), possible application(image processing, clustering, etc.) advantages, disadvantages

2.1 Basis ML 1(maybe Data)

We could speak a lil bit more about data in this topic?

2.2 Basis ML 2

TBA

3 Classical learning

Difference between Supervised unsupervised.

3.1 Supervised

Um einen Abfragepunkt zu klassifizieren, nutzt diese Methode die gespeicherten

3.1.1 Regression

Like for all other subsubsections i would sugest that we structure the Algorithms like in the table at Ch.2.(**Algorithm**, **possible application**, etc.), but also add some links etc. Trainingsdaten und berechnet den Abstand zu den jeweiligen Merkmalen. In

3.1.2 Classification

See regression

3.2 Unsupervised

See regression

3.2.1 Clustering

See regression

3.2.2 Pattern search

See regression

3.2.3 Dimension Reduction

See regression

4 Neural Networks and Deep Learning

4.1 Convolutional Neural Networks CNN

A Convolutional Neural Network is a Deep Learning algorithm which is primarily used to classify images. It can more easily capture spatial (and temporal) dependencies since the convolution filters use a linear combination of neighboring pixels to calculate an output value. After a convolution filter is applied, a Max-Pooling filter can be applied, which lowers the amount of nodes in the network. A 2x2 Max-Pooling filter, for example, replaces every 2x2 square with the maximal value in that square, resulting in lowering the amount of nodes after that layer to a quarter. At the end the multidimensional layers are flattened to a one dimensional vector that is connected to the output via a fully connected layer.

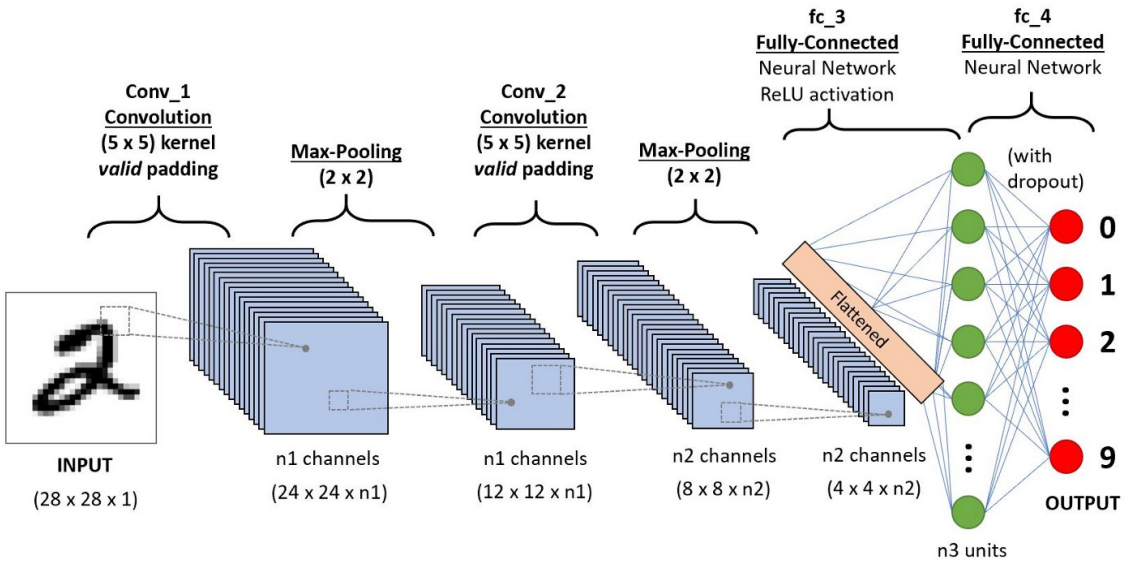

Figure 2: Example of a CNN architecture

Helpful links:

A Comprehensive Guide to Convolutional Neural Networks — the ELI5 way

`https://towardsdatascience.com/a-comprehensive-guide-to-convolutional-neural-net`

4.2 Recurrent Neural Networks RNN

A recurrent neural network (RNN) is a type of artificial neural network commonly used in speech recognition and natural language processing. It uses feedback loops, that allow information to persist (the network has memory), to process sequences of data.

4.3 Generative adversarial networks GAN

Generative adversarial networks (GANs) are algorithmic architectures that use two neural networks, pitting one against the other in order to generate new, synthetic instances of data that can pass for real data. They are used widely in image generation, video generation and voice generation.

One neural network, called the generator, generates new data instances, while the other, the discriminator, evaluates them for authenticity; i.e. the discriminator decides whether each instance of data that it reviews

belongs to the actual training dataset or not.

Helpful links:

A Beginner's Guide to Generative Adversarial Networks (GANs)

https://pathmind.com/wiki/generative-adversarial-network-gan

4.4 Autoencoders

Autoencoders are a specific type of feedforward neural networks where the input is the same as the output. They compress the input into a lower-dimensional code and then reconstruct the output from this representation. The code is a compact "summary" or "compression" of the input. An autoencoder consists of 3 components: encoder, code and decoder. The encoder compresses the input and produces the code, the decoder then reconstructs the input only using this code.

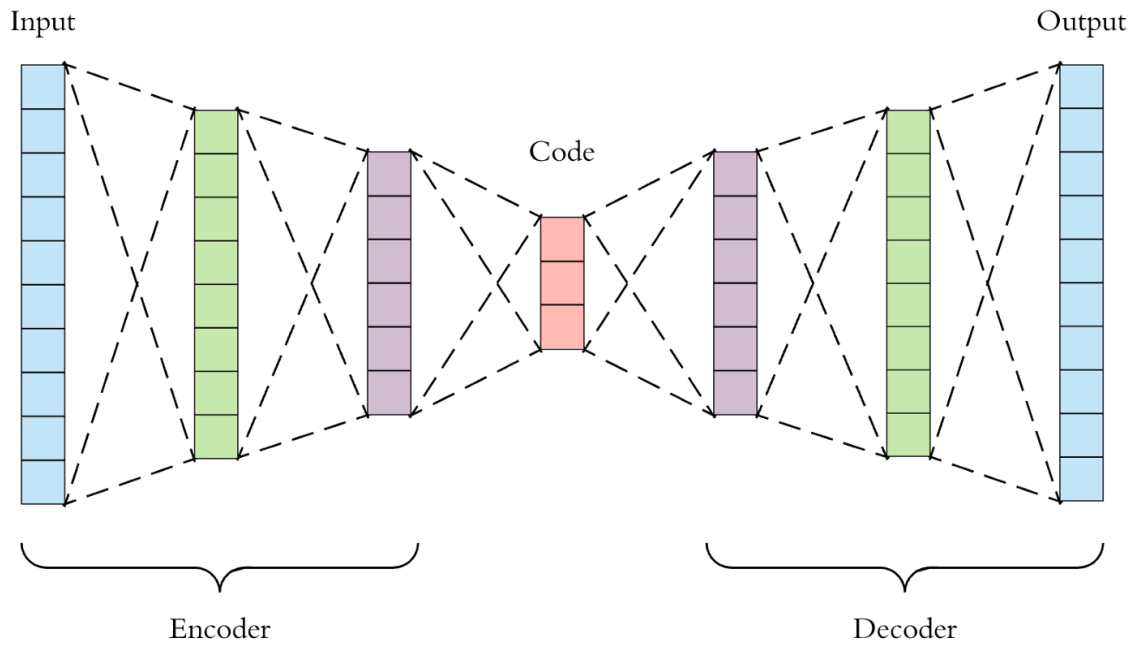

Figure 3: Example of an autoencoder architecture

Helpful links:

Applied Deep Learning - Part 3: Autoencoders

https://towardsdatascience.com/applied-deep-learning-part-3-autoencoders-1c083af

4.5 Perceptrons MLP

5 Ensemble Methods

5.1 Bagging

5.2 Boosting

5.3 Stacking

6 Reinforcement learning

Bibliography

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[2] ERTEL, W. (2016): *Grundkurs Künstliche Intelligenz*. Springer Vieweg, Wiesbaden. 4. Auflage.