Machine Learning and AI

- Methods and Algorithms -

Personnal Notes

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Contents

Todo list

Intro

This document will use the following classification for the machine learning algorithms. However their might be some changes. For exemple, some of them will be part of the commons algorithms and not from their real class.

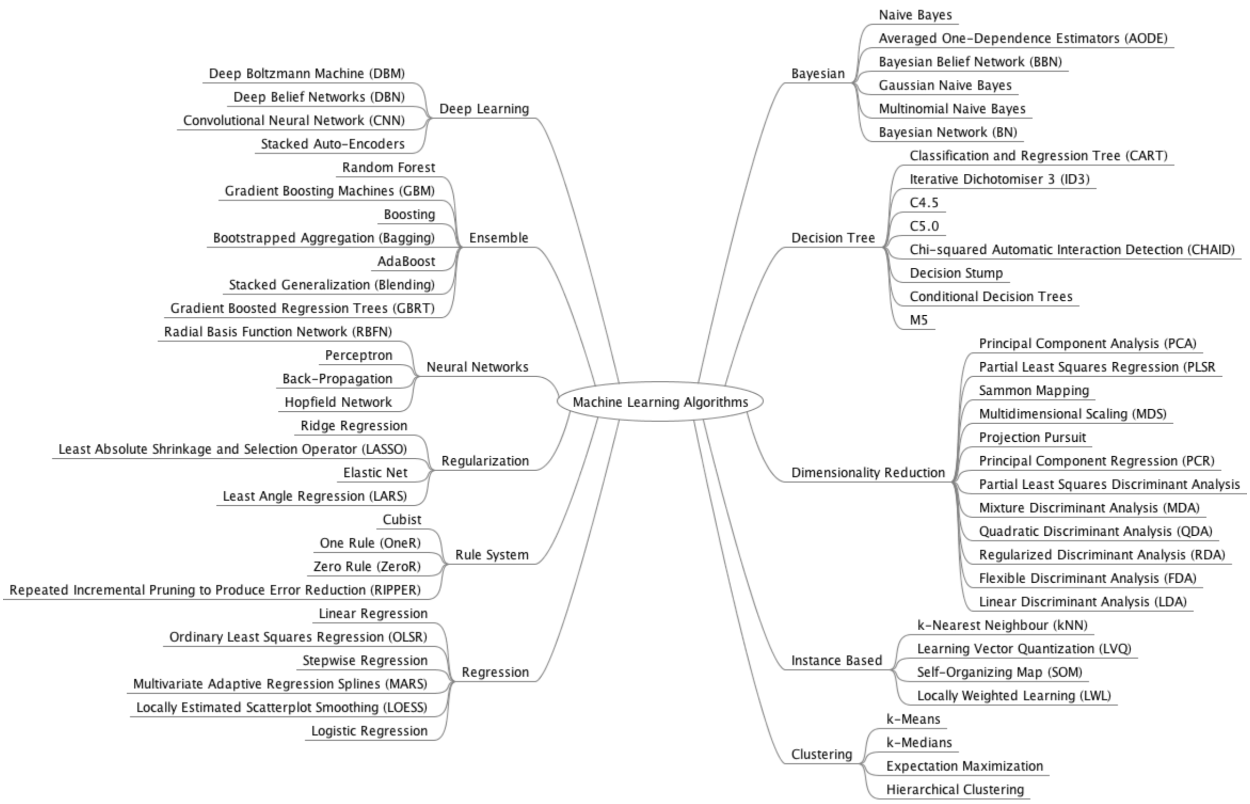

Figure 1 – Simple graph for algorithms classification in ML

Chapter 1

Common Machine Learning algorithms

This chapter is dedicated to the most common ML algorithms, a major part of the notes come from the mml-books.com

Add bibtex reference

Find better paragraph layout

1.1 Linear Regression

1.1.1 Maximum Likelihood Estimation (MLE)

Closed-Form Solution

Maximum A Posteriori Estimation (MAP)

1.2 Gradient Descent

1.2.1 Simple Gradient Descent

1.2.2 Gradient Descent with Momentum

1.2.3 Stochastic Gradient Descent

1.3 Model Selection and Validation

1.3.1 Cross-Validation

1.3.2 Marginal Likelihood

1.4 Bayesian Linear Regression

1.4.1 Mean and Variance

1.4.2 Sample function

Chapter 2

Argumentation Framework

This chapter are notes from the Imperial Course Machine Arguing from Francesca Toni.

add ref

introduction Argument Framework are a field in AI which provide way of evaluate any debate problem. It is useful to resolve conflict, to explain decision or to deal with incomplete information.

2.1 Abstract Argumentation

2.1.1 Simple AA

Definition 1
*an **AA framework** is a set* Args *of arguments and a binary relation* attacks. $(\alpha, \beta) \in$ attacks *means α attacks β.*

Semantics in AA In order to define a "winning" set of argument, we need to provide semantics over the the framework. This is like recipes which determine good set of arguments.

Definition 2

- ***conflict-free***
- ***admissible:*** *c-f and attacks each attacking argument.*
- ***preferred:*** *maximally admissible.*
- ***complete:*** *admissible + contains each argument it defends.*
- ***stable:*** *c-f + attacks each argument not in it.*
- ***grounded:*** *minimally complete.*

- ***sceptically preferred:*** *Intersection of all prefered.*
- ***ideal:*** *maximal admissible and containing all prefered.*

Definition 3
Semi-stable extension: *complete such as* $A \cup A^+$ *is maximal.* A^+ *is the set of attacked argument by A.*

add ref to ASPARTIX and CONARG

2.1.2 Algorithms for AA

Computing the grounded labelling: Here is an algorithm to compute a grounded labelling

```
Data: An AA Framework
Result: The grounded Labelling
Label all unatacked argument with IN ;
while The IN and the OUT are not stable do
    Label OUT the arguments attacks by IN ;
    Label IN the arguments only attacked by OUT;
end
Label the still unlabelled UNDEC;
```

Algorithm 1: Computing the grounded labelling

Computing membership in preferred/grounded/ideal extensions; In order to compute membership, we use Dispute Tree.

We compute a dispute tree for an argument, and apply the different semantics which are easier to compute on a tree than on a graph.

add algos of computing dispute tree + def of semantics

Computing stable extension: We use answer set programming with logical program.

2.1.3 AA with Suppport

Bipolar Abstract Argumentation

We add a **Support** relation to a classic AA Framework. There are different semantics, but we focus here one the QuAD (**Quantitative Argument Debate**) which add a numerical strenght to any argument, and give rule for updating strenght regarding the supporters or attackers.

Add DF-QuAD rules and algorithm

2.1.4 Argument Mining

2.1.5 AA with Preference Probabilist

2.2 Assumption-Based Argumentation

2.2.1 Simple ABA

2.2.2 ABA more DDs

2.2.3 p-acyclic ABA

2.3 ArgGame