UiT Norges arktiske universitet

DTE-2501 AI Methods and Applications

Basic introduction to AI

Lecture 1/3 – Introduction

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Overview

I Introduction

II Basic terminology

III Machine learning techniques

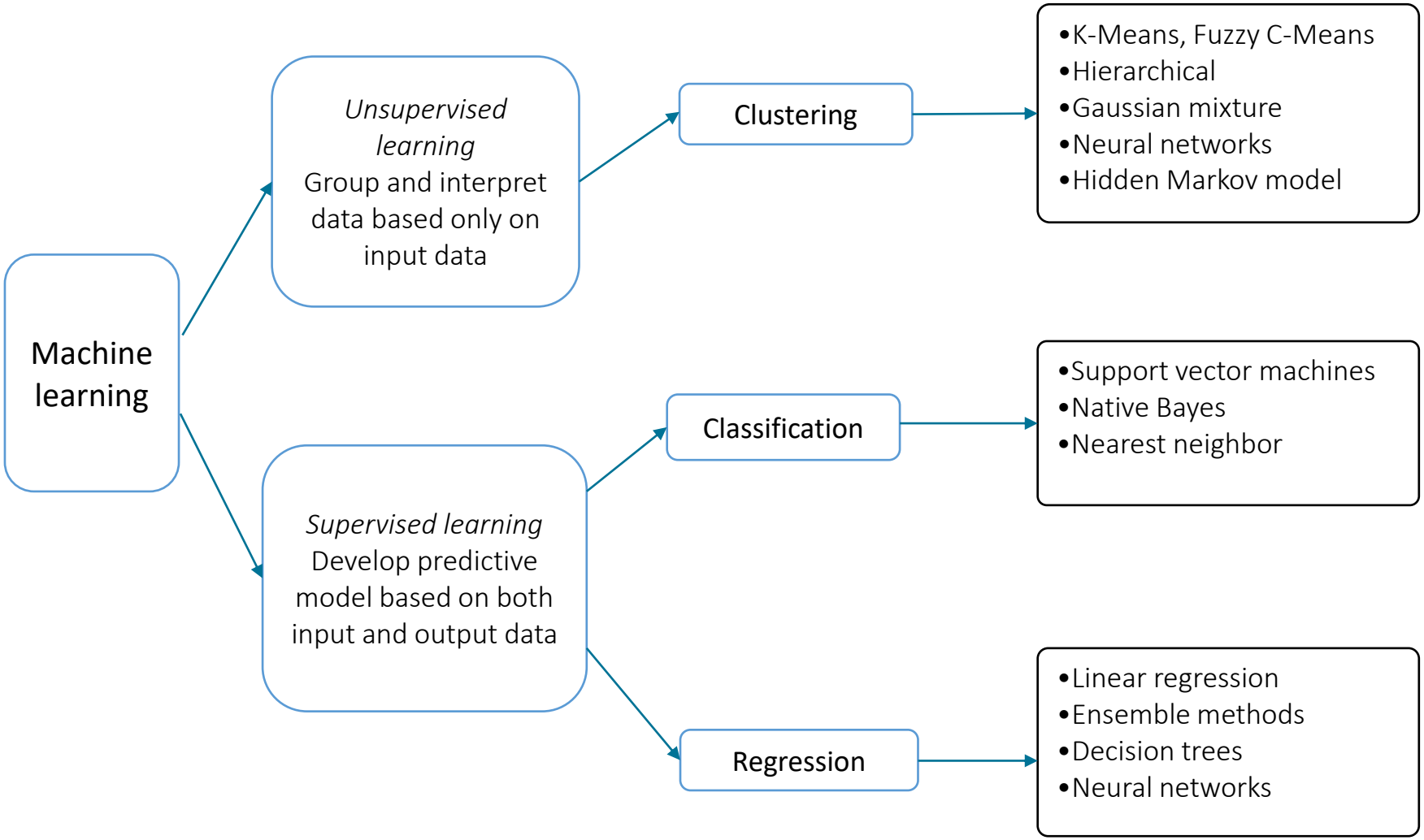
IV Cross-industry standard process for data mining

I Introduction

- statistical data analysis
- artificial intelligence (1955)
- pattern recognition
- machine learning (1959)
- statistical learning
- data mining (1989)
- data science (1997)
- business analytics
- predictive analytics (2007)
- big data (2008)
- big data analytics

- Smart vehicles
- Smart buildings
- Precision medicine
- AI-enhanced education
- …

Diversity of machine learning approaches



II Basic terminology

Supervised learning trains a model on known input and output data so that it can predict future outputs.

Let X be a set of inputs and Y be a set of outputs. The learning goal is to find an unknown *target function* $y: X \rightarrow Y$.

$\{x_1, \dots, x_l\} \subset X$ is a set of training samples, l is the cardinality of the data set.

$y_i = y(x_i), i = 1, \dots, l$, known responses (outputs).

We seek for an algorithm (decision function) $a: X \rightarrow Y$, such that it approximates y on the entire set X.

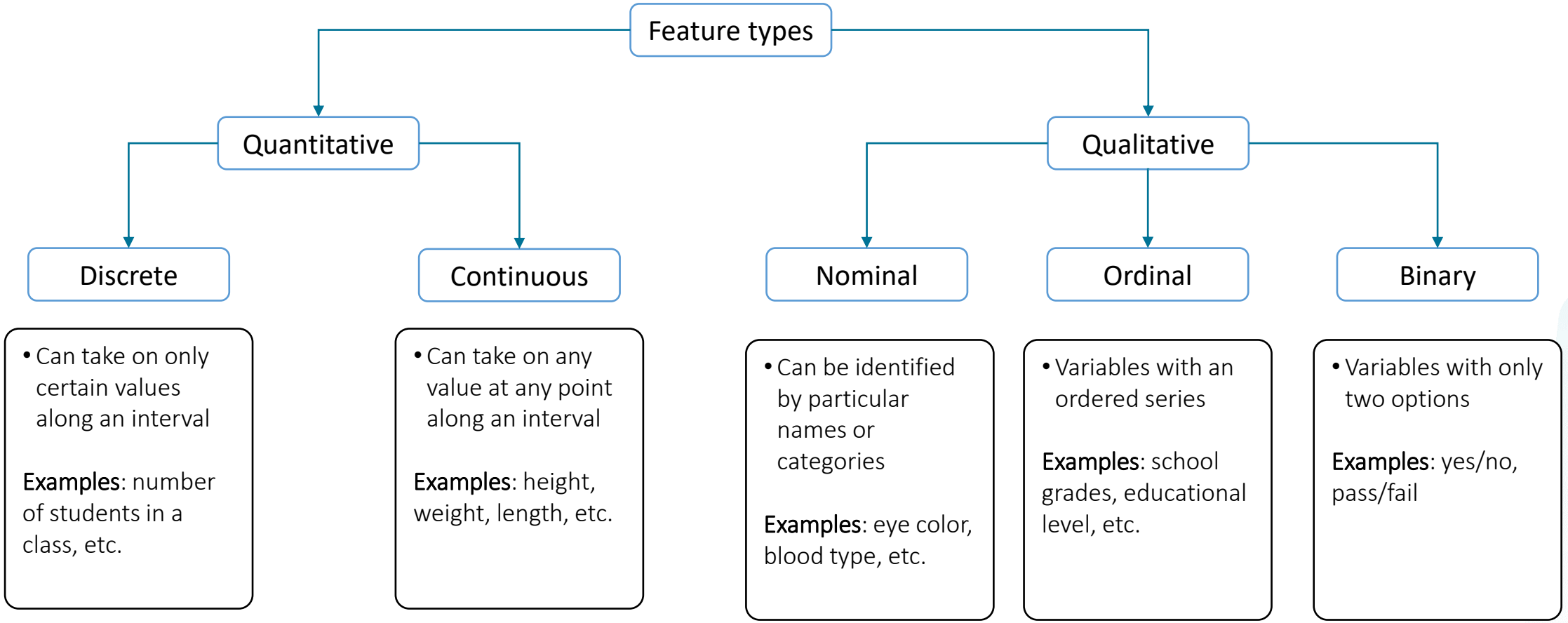
Basic terminology

Feature (attribute) is a mapping $f: X \to D_f$, where D_f is a set of possible feature values.

Let $f_1, \dots, f_n$ is a set of features. A vector $(f_1, \dots, f_n)$ is called a feature description of the object $x \in X$. A set of all feature descriptions, written as a table of size $l \times n$ is called a *feature data matrix*:

$$F = \left[f_j(x_i)\right]_{l \times n} = \begin{pmatrix} f_1(x_1) & \dots & f_n(x_1) \\ \vdots & \ddots & \vdots \\ f_1(x_l) & \dots & f_n(x_l) \end{pmatrix}$$

Basic terminology



III Machine learning techniques

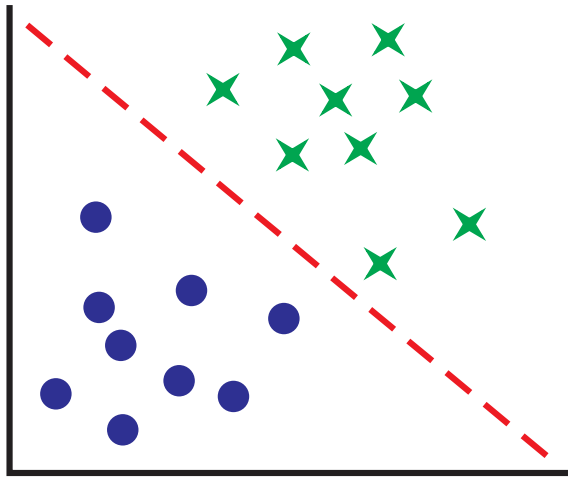
- *Classification techniques* predict discrete responses

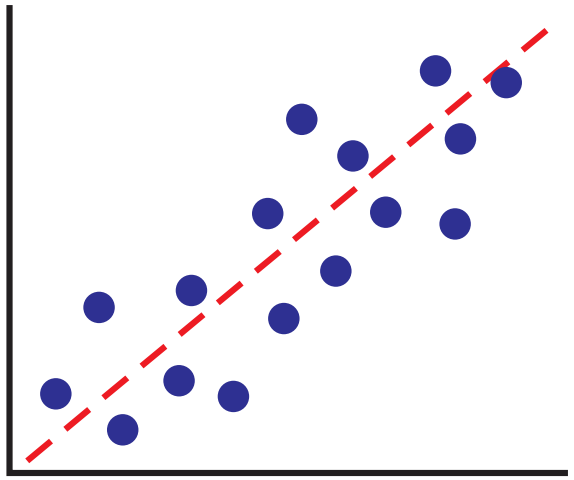
  $Y = \{1, -1\}$ is two class classification

  $Y = \{1, \dots, M\}$ is M class classification

- *Regression techniques* predict continuous responses

  $Y = \mathbb{R}$ or $Y = \mathbb{R}^m$





IV Cross Industry Standard: CRISP-DM Process for Data Mining (v.1 1999)

Open standard process model that describes common approaches used by data mining experts