① Predictive or Supervised learning

→ Goal: to learn the mapping input $\underline{x}$ to output y. Given $D = \{(\underline{x}_i, y_i)\}_{i=1}^{N}$

D = training set, N = no. of training examples

→ y_i ⇒ categorical or nominal variable, $y_i \in \{1, \ldots, C\}$

$\underline{x}$ → vector consisting of features, attributes or covariates

② When y_i is a categorical or nominal var the problem is classification or pattern recognition.

y_i is real-valued, the problem is known as regression

* Label space $\mathcal{Y}$ has some natural ordering ⇒ ordinal regression (Grades A-F)

③ Descriptive or unsupervised learning

- only inputs $D = \{x_i\}_{i=1}^{N}$; goal is to find interesting patterns, (knowledge discovery)
- ND comparison as no y.

④ Reinforcement learning

- How to act / behave when given occasional reward or punishment signals.

SUPERVISED learning

Goal to learn the mapping from $\underline{x}$ to y

$y \in \{1, \ldots, C\}$ C = no. of classes

$y \in \{0, 1\}$ $C = 2$, (Binary classification)

$C > 2$ (multiclass classification)

multi-label classification ⇒ labels are not mutually exclusive

or

multiple output model (Eg. tall & strong)

function approximation: $y = f(\underline{x})$, now our goal is to estimate f given a labeled training set, and then make predictions using $\hat{y} = \hat{f}(\underline{x})$, hat symbol to denote an estimate