

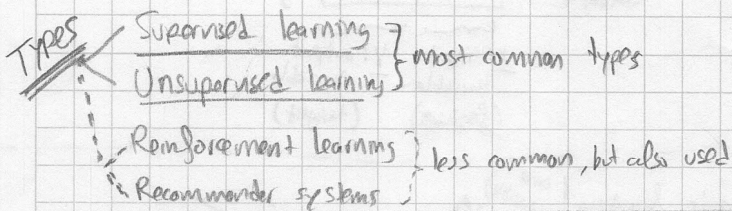
• Machine Learning → teach computers how to think without being programmed.

A computer program that learns from experience  $E$  with respect to some task  $T$ , and some performance measure  $P$ , if its performance on  $T$ , as measured by  $P$ , improves with experience  $E$ .

$E$ : watch a user marking marks as spam

$T$ : classify emails as spam/not spam

$P$ : fractions of emails correctly classified



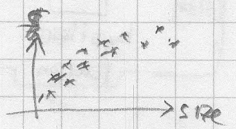
It's important to understand how to use the algorithms, how to apply them, how to modify them...

### Supervised Learning

- We give the algorithm a data-set of right answers

• For example, we have data about house prices regarding their size; we can predict the price for a given size using regression lines.

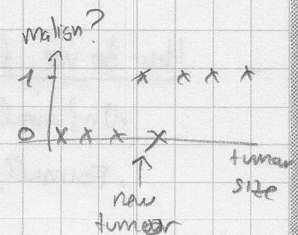
predict continuous valued output



• For example, we have data about malignant/benign tumor sizes, and we want to predict a new tumor given its size.

this is a classification problem

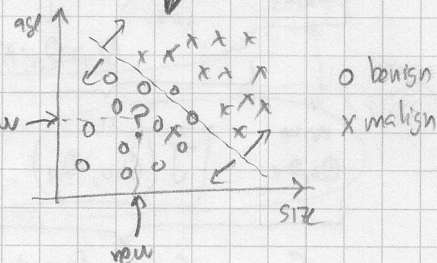
→ discrete valued output



ML algorithms want to work with an "infinite" number of features!

and many more features (dimensions)

- clump thickness
- uniformity of cell size
- " " " type
- ...



### Unsupervised Learning

- The algorithm is given data without 'labels', without structure. The ML problem has to find some structure there...

$x_2$  |  $x_1$  → clustering: group data-points because they are 'similar'. we are not telling which clusters to create, the right answer

### Cocktail Party Problem

• about separating two conversations recorded with two different microphones

