1 Introduction to Machine Learning

Contents

Definition 1.1 (Machine Learning (Arthur Samuel, 1959))**.** "Field of study that gives computer the ability to learn **without** being explicitly programmed."

> *Remark.* Samuel wrote a computer program that played 10,000 games of checkers against itself - one of the world's first self-learning program.

1.1 Machine learning algorithms

1.1.1 Supervised Learning

Definition 1.2. In **supervised learning** we teach the computer how to solve some problem, and then let it use its new found knowledge to solve similar problems.

Example. ***Regression vs. classification***

Figure 1: TOP: ***regression*** *problem (****continuous*** *valued output)*: What is the best predictor of house price - straight or quadratic?
BOTTOM: ***classification*** *problem (****discrete*** *valued output)*: What is the likelihood of my friend with a tumour of size x having a malignant or benign cancer?

Example. ***Classification under multiple attributes***

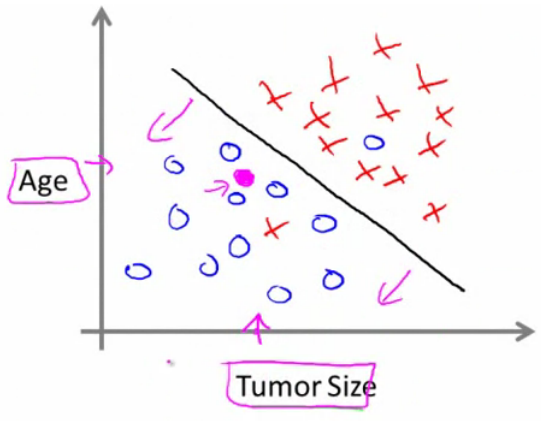

Figure 2: What is the likelihood of my friend with a tumour of size x **and** of age y having a malignant of benign cancer?

Note. We can deal with problems that have an infinite number of attributes (see support vector machine in chapter).

1.1.2 Unsupervised Learning

Definition 1.3. In **unsupervised** learning, we let the computer determine its own structure and patterns in the data.

Example 1.1. ***Clustering (*relationships among the variables in the data*)***

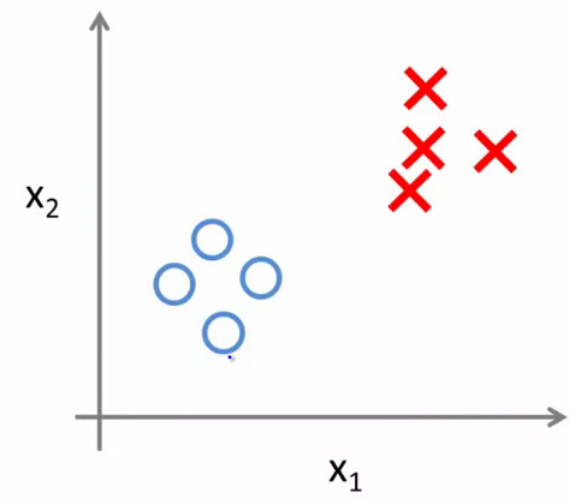

Figure 3: Given an **unknown** data set, can you find some structure to the data? E.g. Google News - given a set of new articles, group them into cohesive groups.