Chapter 1

Machine Learning framework

We begin with the description of a formal model in order to capture what could be the learning tasks. The fundamental points are:

- **The learner's input**:
  - A domain set $\mathcal{X}$, whose points are the istances we want to label.
  - A label set Y.
  - The training dataset $S = X \times Y$. It is a finite sequence of label domani points.
- **The learner's output**:
  - A prediction rule $h : \mathcal{X} \to \mathcal{Y}$ (also called predictor or hyothesis or classifier). It is used to predict the label of new domain points. Therefore $A(S)$ is the hypothesis, where A represents the algorithm.
  - **Simple data-generation model**:
    Assume that the training data are generated by a probability distribution $\mathbb{D}$ (over $\mathcal{X}$). Moreover, suppose that the learner doesn't know anything about the distribution and that there exists some