PAC Learning

We say that a concept class C is PAC learnable by a set H of hypotheses if there is a learning algorithm L that for any ϵ, δ, for any $c \in C$, and for any probability distribution D over the examples of c

(a) L gets as input $m(\epsilon, \delta)$ examples, where m is polynomial in $1/\epsilon$, $1/\delta$. The examples are obtained by sampling from the probability distribution D.

(b) L run time is polynomial in $1/\epsilon$, $1/\delta$, and some natural size parameters of C.

(c) The output of L is a hypothesis $h \in H$ such that with probability of at least $1 - \delta$,

$$\sum_{c(e) \neq h(e)} D(e) \quad < \quad \epsilon.$$

We call ϵ the accuracy parameter and δ the confidence parameter.

The smallest polynomial $m(\epsilon, \delta)$ (for the optimal L)is called the sample complexity of C, and the smallest polynomial that bounds the run time of the optimal L is called the time complexity of C.