Machine Learning: Foundations	Spring Semester, 2001/2

Homework 4: May 28

Lecturer: Yishay Mansour

Homework number 4.

Theory question:

1. For each d, show that if two concept classes C_1 and C_2 have both VC dimension d, their union has VC dimension at most $2d$.
2. For each d, show two concept classes C_1 and C_2 whose VC dimension is d, and whose union has VC dimension $2d$.
3. [**Bonus**] Show that if the concept classes C_i, $1 \leq i \leq d$ have VC dimension at most d, then their union $\mathcal{C} = \cup_i C_i$ has VC dimension at most $(2 + o(1))d$.

Programming assignment:
Implement the the follwoing two hyperplane algorithms.

1. The hypothesis is $h_w(x) = \sum_{i=1}^{n} w_i x_i$. Use the Gradient Descent algorithm to find a weight vector w that minimizes the square error.
2. The hypothesis is $h_w(x) = \sigma(\sum_{i=1}^{n} w_i x_i)$, where σ is the sigmode function. Use the Gradient Descent algorithm to find a weight vector w that minimizes the square error.

Answer the following questions:

1. Compare the performance of the two algorithms.
2. Compare the weights generated by the two algorithms.

The homework is due in two weeks