Machine Learning Homework 3
Fall, 2009

Chun-Wei Liu, Te-Kang Jan and Ken-Yi Lin

National Taiwan University

November 2, 2009

Problem Grading

The problems are graded as following arrangement:

Problem 3.1 (1)-(6)	Te-Kang Jan
(7) Problem 3.2	Chun-Wei Liu
Problem 3.3 Problem 3.4	Ken-Yi Lin
Problem 3.5	Hsuan-Tien Lin

Problem 3.1 (1)-(6)

- some people lose their points because they didn't write the calculate process.
- even the problem is really easy, make sure you wrote the reason for the answer.

Problem 3.1 (7)

Prove the following hypothesis set for $x \in \Re$ is of an infinite VC dimension:

$$H = \{h_\alpha : h_\alpha(x) = (-1)^{\lfloor \alpha x \rfloor}\}$$

,where $\alpha \in \Re$.

- there must be 2^N's dichotomies, if we chose a proper data set with N points.
- statement above is true for any N.

Problem 3.1 (7)

Prove the following hypothesis set for $x \in \Re$ is of an infinite VC dimension:

$$H = \{h_\alpha : h_\alpha(x) = (-1)^{\lfloor \alpha x \rfloor}\}$$

,where $\alpha \in \Re$.

- there must be 2^N's dichotomies, if we chose a proper data set with N points.
- statement above is true for any N.

Problem 3.1 (7)

Prove the following hypothesis set for $x \in \Re$ is of an infinite VC dimension:

$$H = \{h_\alpha : h_\alpha(x) = (-1)^{\lfloor \alpha x \rfloor}\}$$

,where $\alpha \in \Re$.

- there must be 2^N's dichotomies, if we chose a proper data set with N points.
- statement above is true for any N.

Problem 3.1 (7)

Prove the following hypothesis set for $x \in \Re$ is of an infinite VC dimension:

$$H = \{h_\alpha : h_\alpha(x) = (-1)^{\lfloor \alpha x \rfloor}\}$$

,where $\alpha \in \Re$.

- there must be 2^N's dichotomies, if we chose a proper data set with N points.
- statement above is true for any N.

Possible approaches

- show us the α and x.
- there are 2^N dichotomies for a data set with N points.

Problem 3.1 (7)

show me the α and x

$$x_i = 10^{1-i}$$
$$\alpha = \sum (1/2) * (1 - y_i) * 10^{i-1}$$

e.g $N = 4$, $dichotomy = \{+, -, +, -\}$

$$\alpha = 0 + 10 + 0 + 1000 = 1010$$
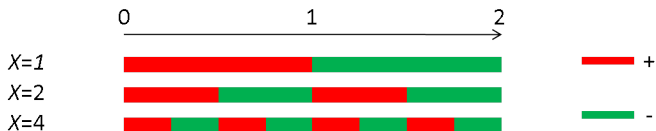$$h_\alpha(1) = 1$$
$$h_\alpha(10) = -1$$
$$h_\alpha(100) = 1$$
$$h_\alpha(1000) = -1$$

Problem 3.1 (7)

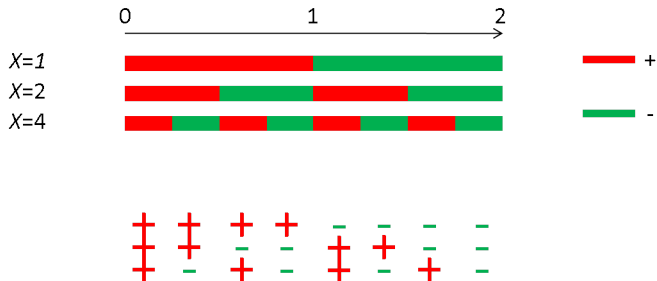there are 2^N dichotomies for a N points data set

e.g $N = 3$, there are 8 dichotomies could be generated

Problem 3.1 (7)

there are 2^N dichotomies for a N points data set

e.g $N = 3$, there are 8 dichotomies could be generated

Feel free to contact with TAs if you have any question about the homework.