# ENPM808A – Introduction to Machine Learning

# Homework – 1

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1.

2.a. Using analytics geo., wTx = 0. h(x) = +1 and h(x) = -1 are separated by a straight line because there are points on one side of the line wTx > 0 and same for wTx < 0. The slope *a* and intercept *b* can be expressed in w0, w1, w2 as:

when w2 ≠ 0

2.b.

Chart, line chart

Description automatically generated

3.

4. The question requires a consideration of the "deviation distance" when updating. In the process of trying, I found that taking 100 for *η* would cause the number to be too large, so here we take 1, 0.1, 0.01, 0.0001

n = 1, time error rate = 0.0

Chart, scatter chart

Description automatically generated

n = 0.1, time error rate = 0.0022

Chart, scatter chart

Description automatically generated

n = 0.01, time error rate = 0.002

Chart, scatter chart

Description automatically generated

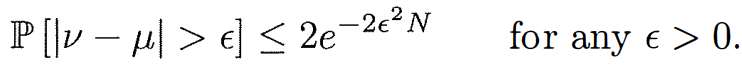
n = 0.0001, time error rate = 0.0001

Chart, scatter chart

Description automatically generated

5.1. Using binomial distribution, there are two kinds of marbles in the box, 90% are red marbles, 10% are green marbles, now we take 10, and ask the probability that the number of red marbles is less than or equal to 1.

5.2. Using Hoeffding Inequality:



Substituting the values:



This is a loose upper bound than the 5.1 (Exercise 1.8) as Hoeffding inequality is universal. Thus, the upper bound must be loose.