**CS5402 Introduction to Machine Learning**

**Assignment 2**

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**Question 1.**

Input Space X: Handwritten digit

Output Space Y: {0, 1, 2, 3, 4, 5, 6, 7, 8, 9}

Target Function f: To get number from handwritten digit

**Question 2.**

Because: sign(x) = , y(t) = 1, -1;

If y(t) sign[], y(t) = -sign[];

So that

**Question 3.**

; so that , ;

**Question 4.**

1. Error bar of : ;

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1. Let’s think about model complexity. The model complexity .

In this case, H for training is 1000, H for test is only 1 and the . If the N becomes larger, the model complexity would become smaller.

If we reserve more data samples for testing, it refers that we have less data samples for training, and the model complexity of training would be larger and the difference between and in training would be larger. Finally, the H we get from training may not good enough, even if the model complexity of testing may become smaller.

**Question 5.**

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Initial guess: N = 4000, put N = 4000 in right-head side.

Find out ;

Let N = , continue to calculate in right-head side.

We finally get the N = 41000

**Question 6.**

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