**Artificial Intelligence**

**HW-02**

**20066193**

**2.1 Solution a)** ∈(M,N,δ) = ;

Where δ = confidence parameter; M = amount of model complexity; N = number of samples;

The values given in the problem are δ = 0.03;M =1 and ∈ ≤ 0.05

∈(M,N,δ) = ≤ 0.05

=> ≤ 0.05

apply squaring on both sides we get

=> ln ≤ 0.0025

=> ln(66.67) ≤ 2N(0.0025)

=> 4.199 ≤ 0.0050N

=> N ≥ 839.8

approximating the samples to a whole number, we get

N ≥ 840 samples

**b)** The values given in the problem are δ = 0.03; M =100 and ∈ ≤ 0.05

∈(M,N,δ) = ≤ ∈

=> ≤ 0.05

apply squaring on both sides we get

=> ln ≤ 0.0025

=> ≤ 0.0025

=> ≤ 0.0025

=>

=>1,760.8 ≤ N

=> N ≥ 1760.8

approximating the samples to a whole number, we get

N ≥ 1761 samples

**c)** The values given in the problem are δ = 0.03M =10,000 and ∈ ≤ 0.05

∈(M,N,δ) = ≤ ∈

=> ≤ 0.05

apply squaring on both sides we get

ln ≤ 0.0025

=> ≤ 0.0025

=> ≤ 0.0025

=> ≤

=>N ≥ 2,682 samples

**2.11 Solution a)** The values given in the problem are mH(N)=N+1; dvc=1; δ = 0.1 and N=100

Using the equation Eout ≤ Ein +

=> Eout ≤ Ein +

=> Eout ≤ Ein +

=> Eout ≤ Ein +

=> Eout ≤ Ein +

=> Eout ≤ Ein + 0.847

**(b)** The values given in the problem are mH(N)=N+1; dvc=1; δ = 0.1 and N=10,000

Using the equation Eout ≤ Ein +

=> Eout ≤ Ein +

=> Eout ≤ Ein +

=> Eout ≤ Ein +

=> Eout ≤ Ein +

=> Eout ≤ Ein + 0.105

We observe that Eout value decreases as the number of samples N increases.

**2.12 Solution )**  From the problem we know that δ = 0.1; dvc=1; ∈ ≤ 0.05

Using the equation N > (ln)

on solving the above equation after substituting the given values and assuming the value of N as 300,000 we get,

=> N ≥ ln(\* ((2\*300,000)10+1))

=> N ≥ 3200\* ln( 80\*(7.3512e+1))

=> N ≥ 3200\* ln(5.88e+28)

=> N ≥3200\*ln(66.244)

=> N ≥ 211,981

Now Assume N= 211,981 we get

* N ≥ 3200 \* ln ( 80 \*(2.144e+59))
* N ≥ 3200 \*ln(1.751e + 61))
* N ≥ 3200 \* 140.997
* N ≥ 451,192.55

Now Assume N = 451,192.55 we get

* N ≥ 3200 \* ln(80\*(3,58e+59))
* N ≥ 3200 \*ln(2.86e+61)
* N ≥ 3200 \* 141.50
* N ≥ 452,831.93

Now Assume 452,831.93 we get

* N ≥ 3200 \* ln(80\*(3.71e+59))
* N ≥ 3200 \* ln(2.97e+61)
* N ≥ 3200 \* 141.54
* N ≥ 452,948.03

So, the value of N converges at N ~ 451,192 samples