Problem 2

I think that the most distinguishing difference between a human generated sequence and a computer-generated sequence is that:

- For computers, writing a new digit – either 1 or 0 has equal probability. That is each digit has a 0.5 chance of being 1 or 0.
- In the case of humans, it is generally not so. The probability of a digit becoming 0 or 1 is dependent on the previous digits. So if the first digit is 1, then the probability of the second digit being 1 becomes less than 0.5 and so on. This is because we tend to not repeat digits after a certain interval. Computers don't have such preconceived notions.
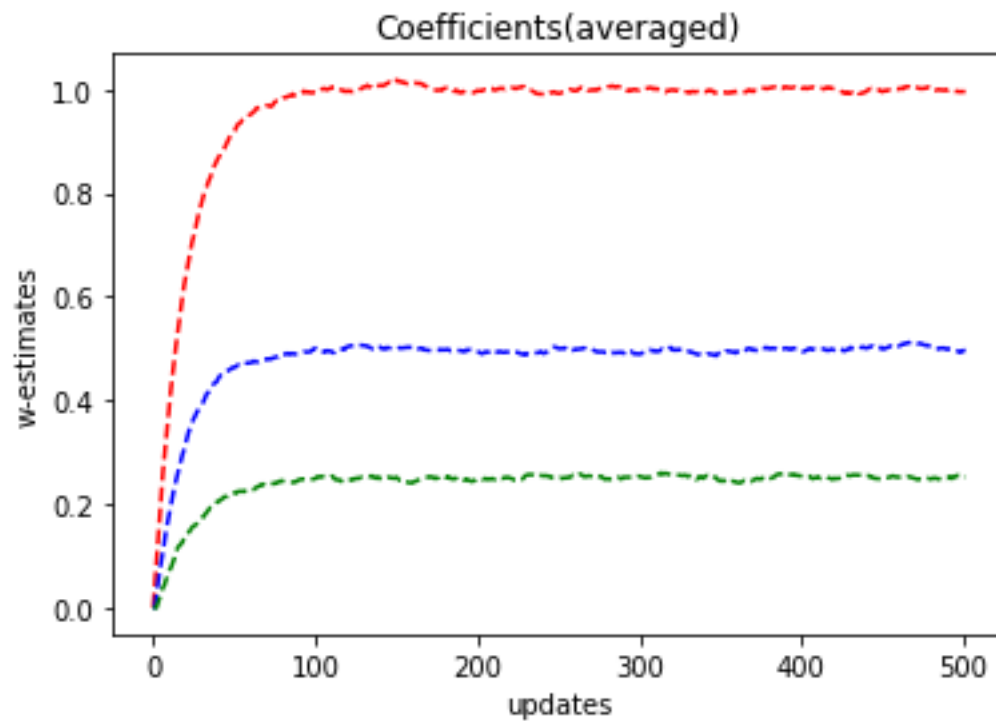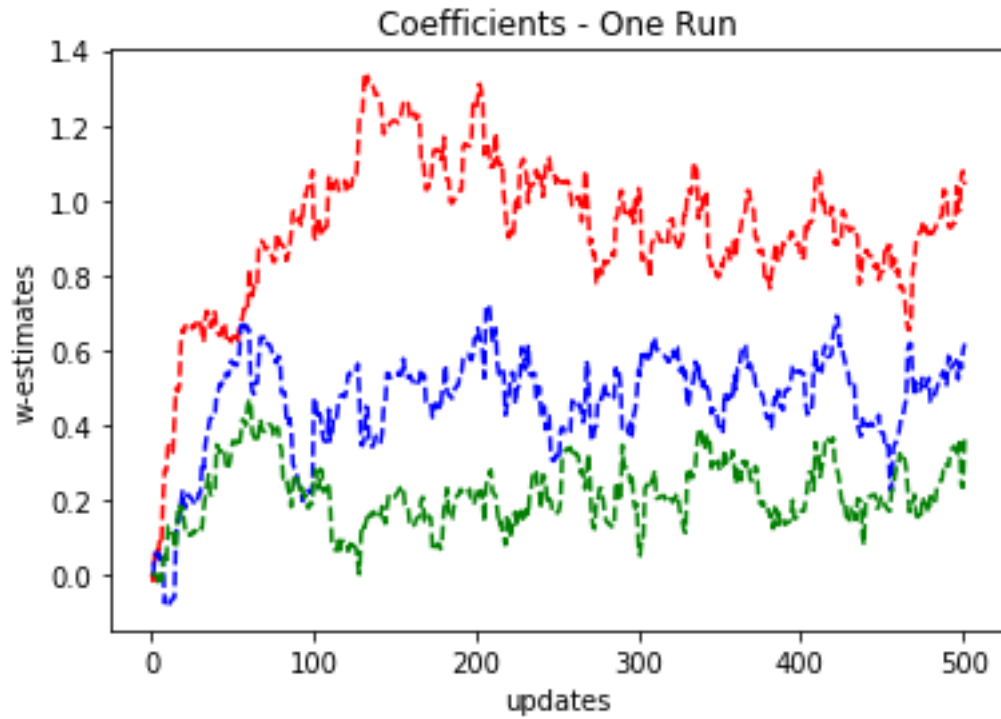
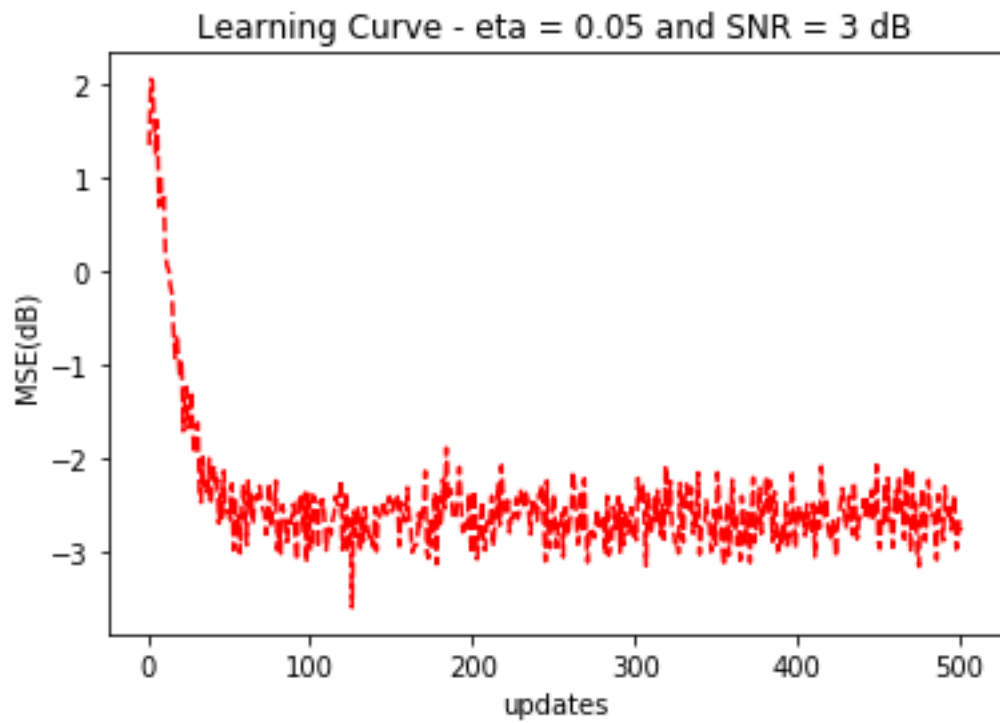So, I think that some good features will be:

- Number of times 0 occurs 3 times in a row, 4 times in a row, and so on till 20 times in a row.
- Number of times 1 occurs 3 times in a row, 4 times in a row, and so on till 20 times in a row.
- Number of times 0 and 1 occur consecutively like 01.
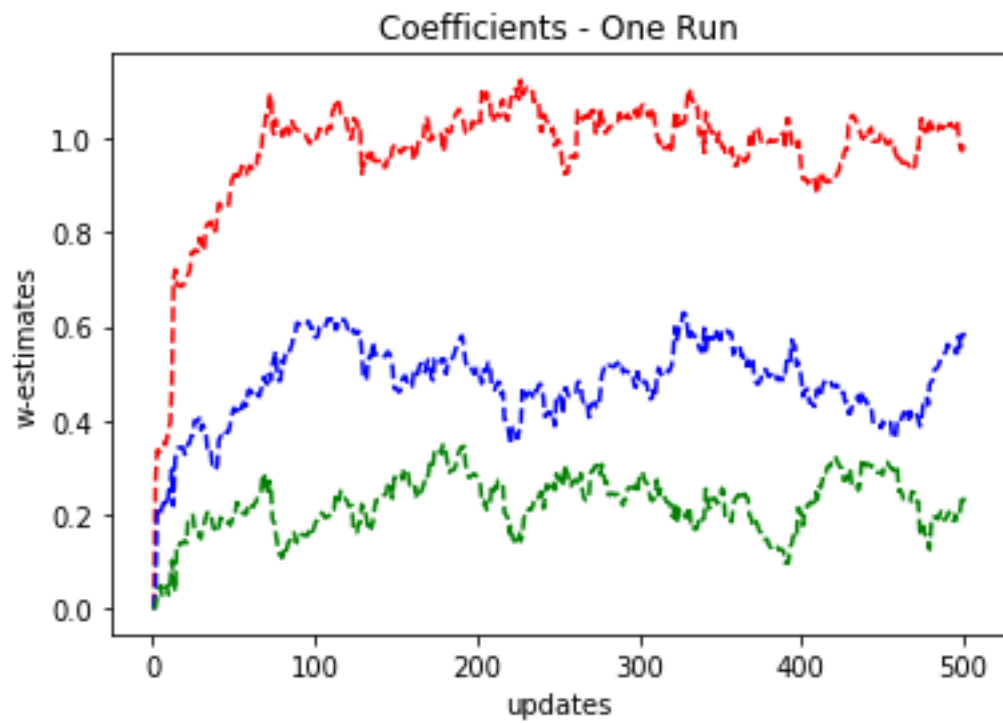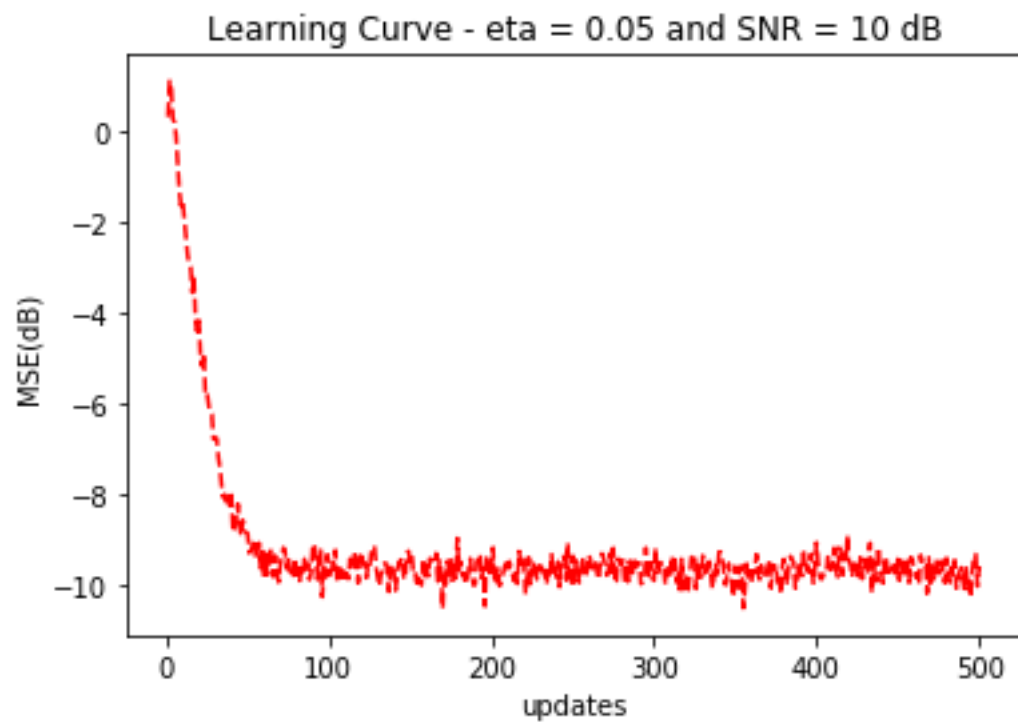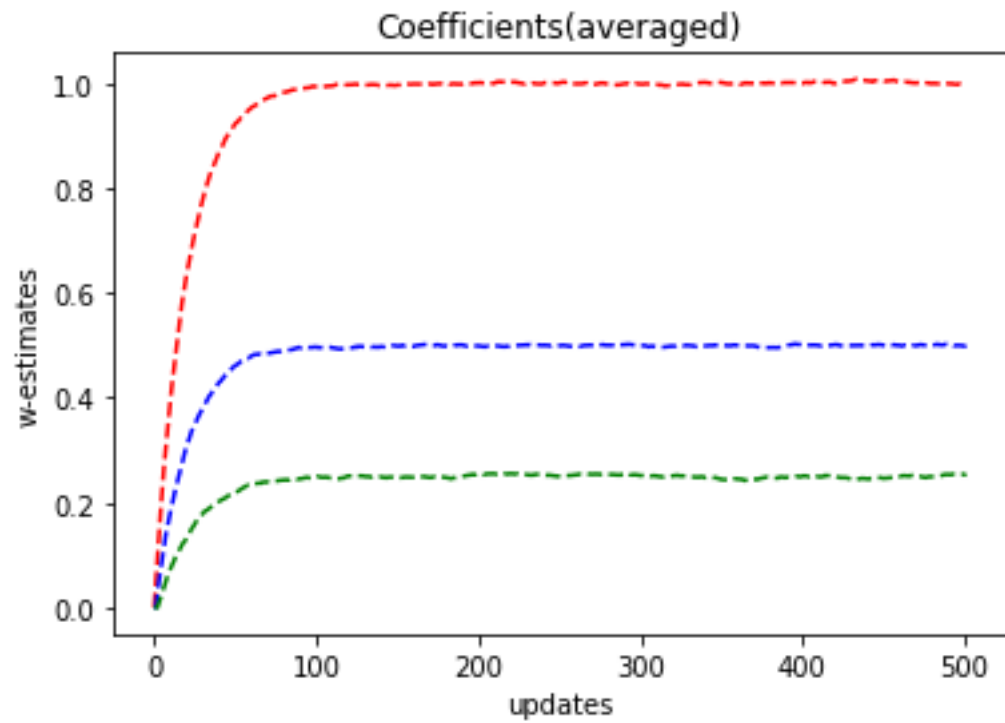- Number of times 0 and 1 occur consecutively like 10.

Problem 3

3.2 (b)

For eta = 0.05 and SNR = 3 dB,

Coefficients - One Run

Coefficients(averaged)

Learning Curve - eta = 0.05 and SNR = 3 dB

For eta = 0.05 and SNR = 10 dB,

Coefficients - One Run

Coefficients(averaged)

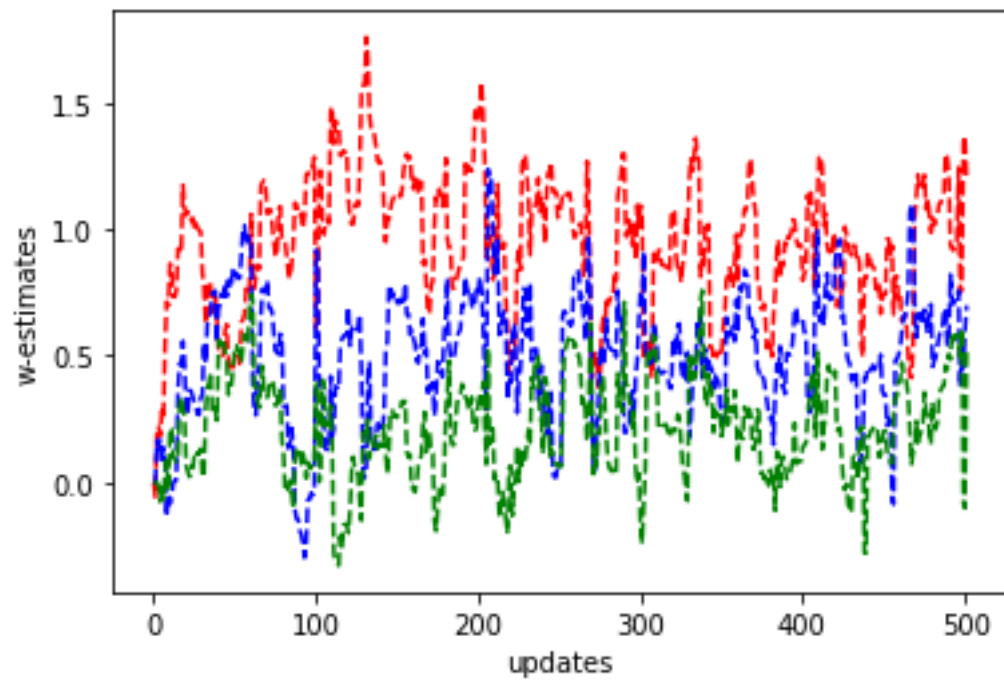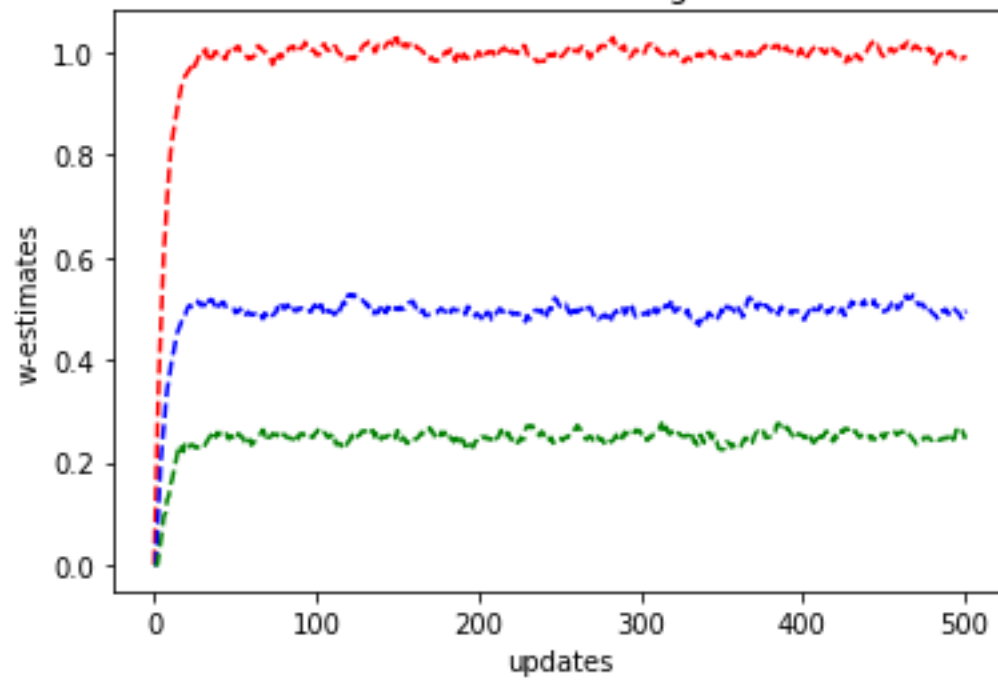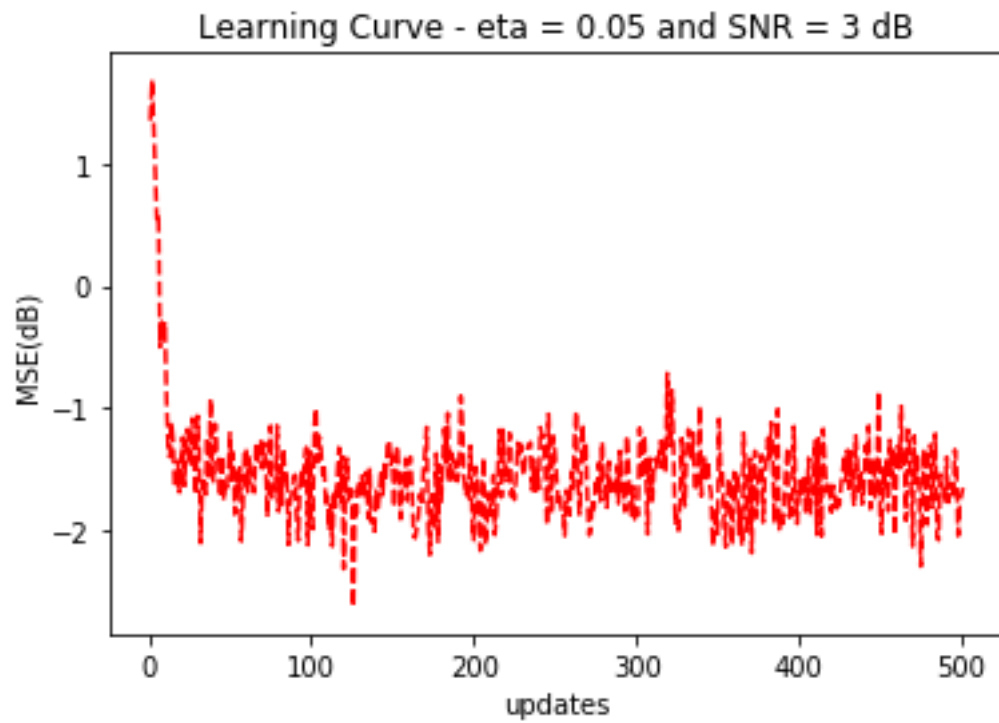Learning Curve - eta = 0.05 and SNR = 10 dB
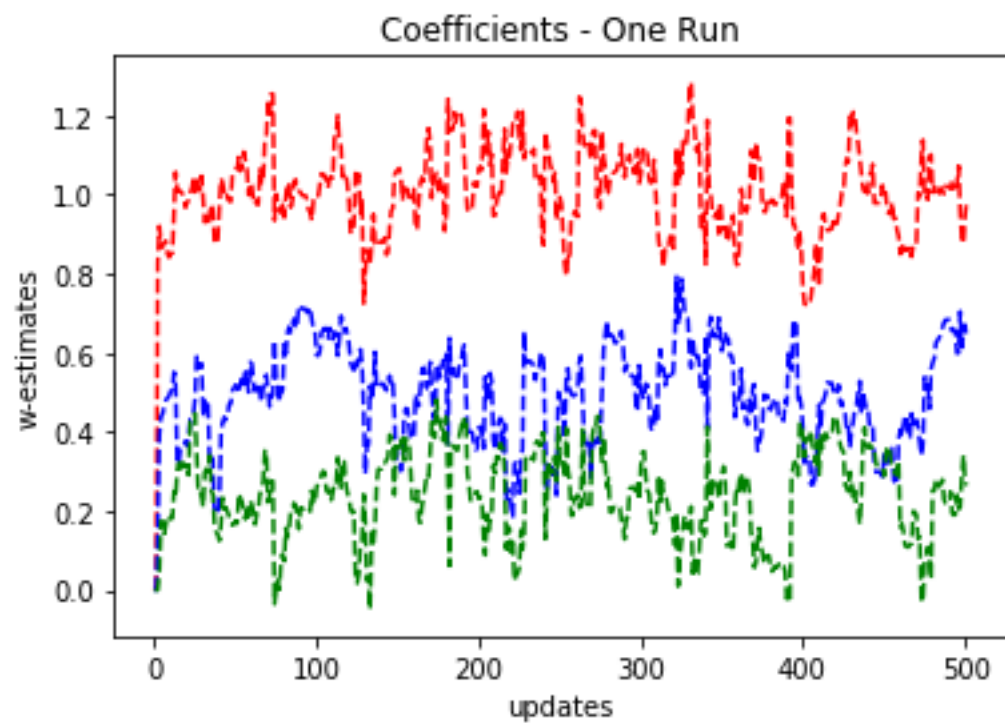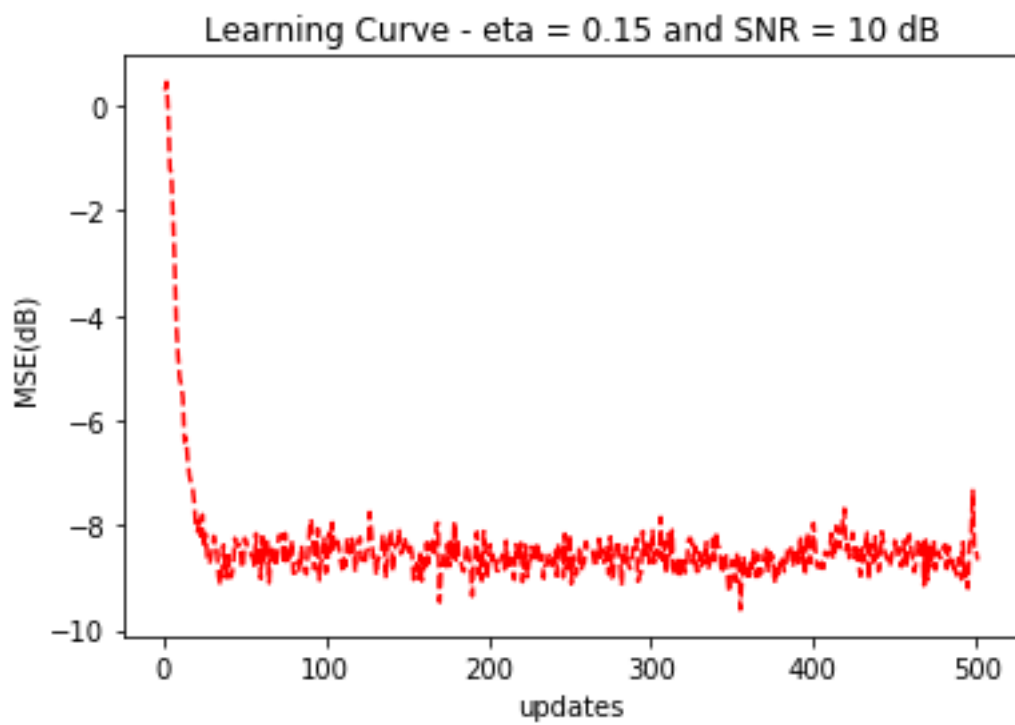
For eta = 0.15 and SNR = 3 dB,

Coefficients - One Run

Coefficients(averaged)

Learning Curve - eta = 0.05 and SNR = 3 dB

For eta = 0.15 and SNR = 10 dB,
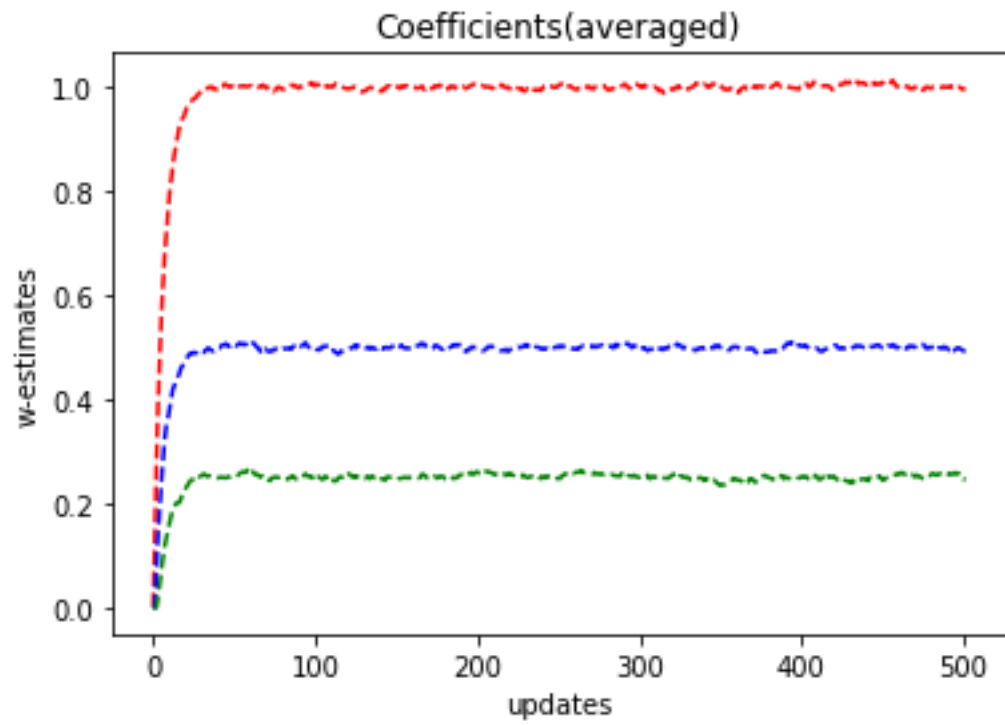

Coefficients - One Run

Coefficients(averaged)

Learning Curve - eta = 0.15 and SNR = 10 dB

3.2 (c)

The MSE for these learning curves are comparable to the LMMSE found in the analytical part above. For the SNR = 3 dB, the MSE is almost equal to the LMMSE. For SNR = 10 dB, the MSE is nearly equal to the LMMSE.

3.2 (d)

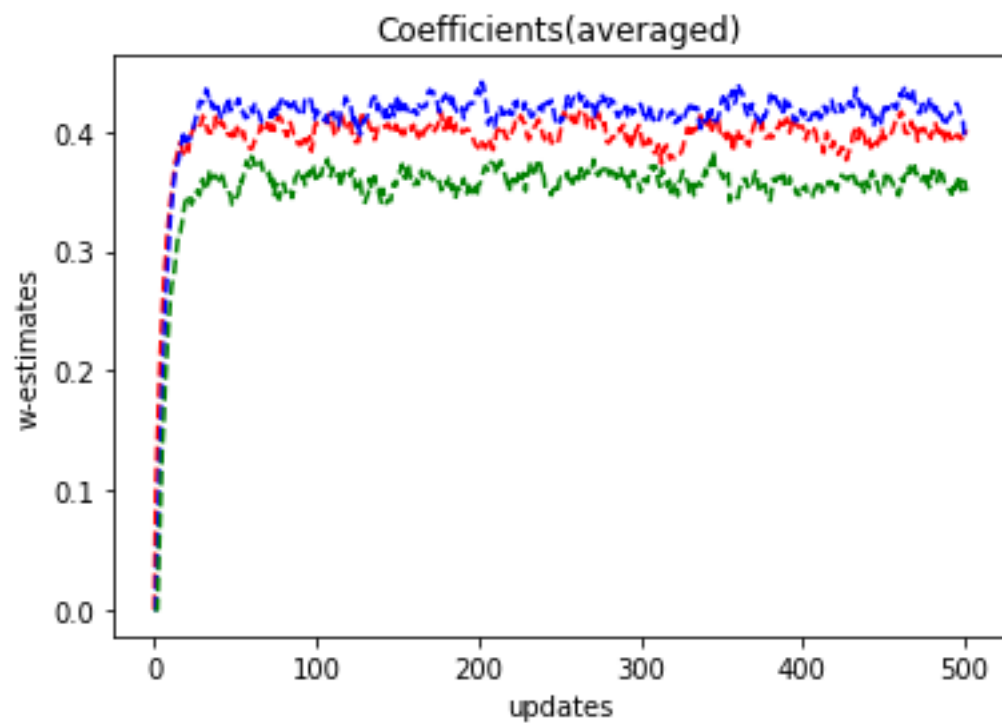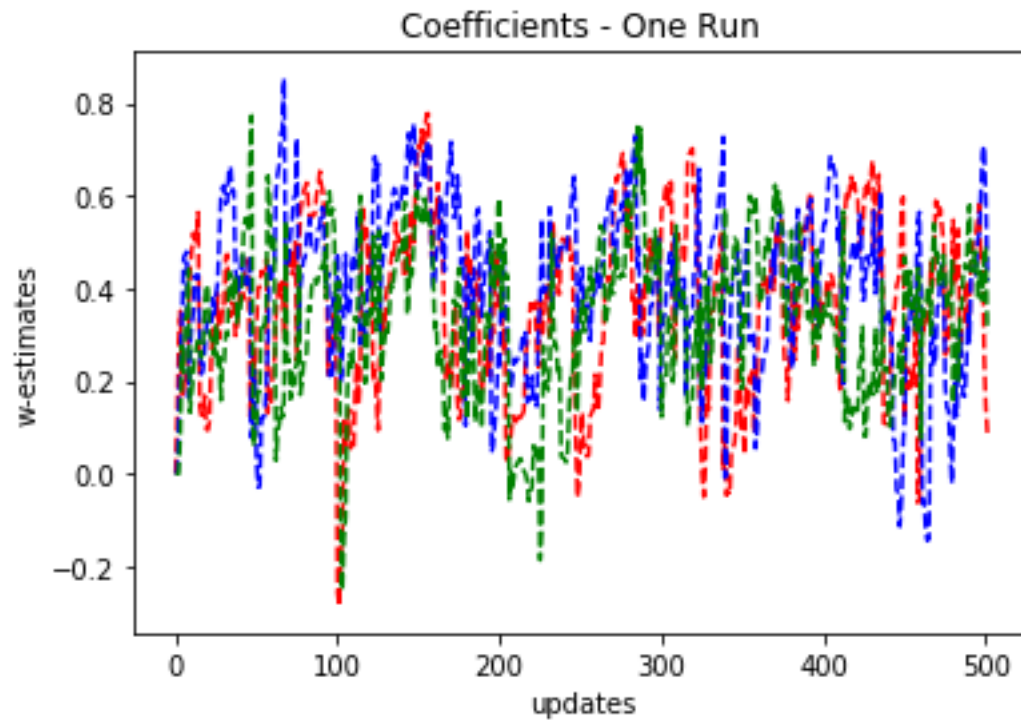For SNR = 3dB, at eta = 0.25, we start getting divergent MSE.

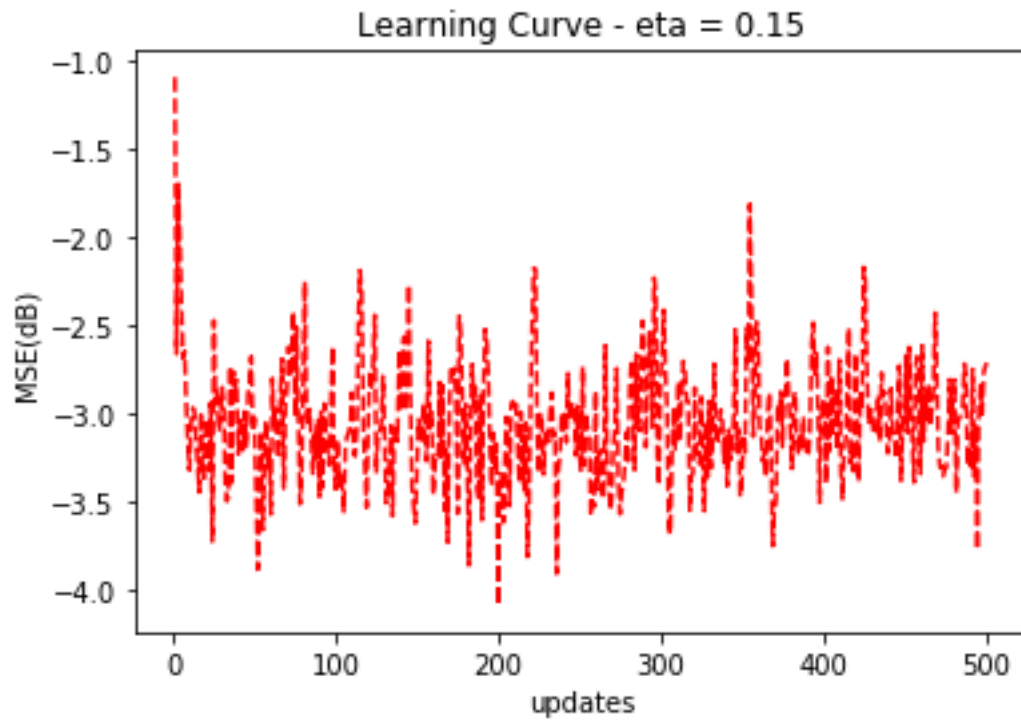For SNR = 10dB, at eta = 0.25, we start getting divergent MSE.

3.3

3.4 (a)

Coefficients - One Run

Coefficients(averaged)
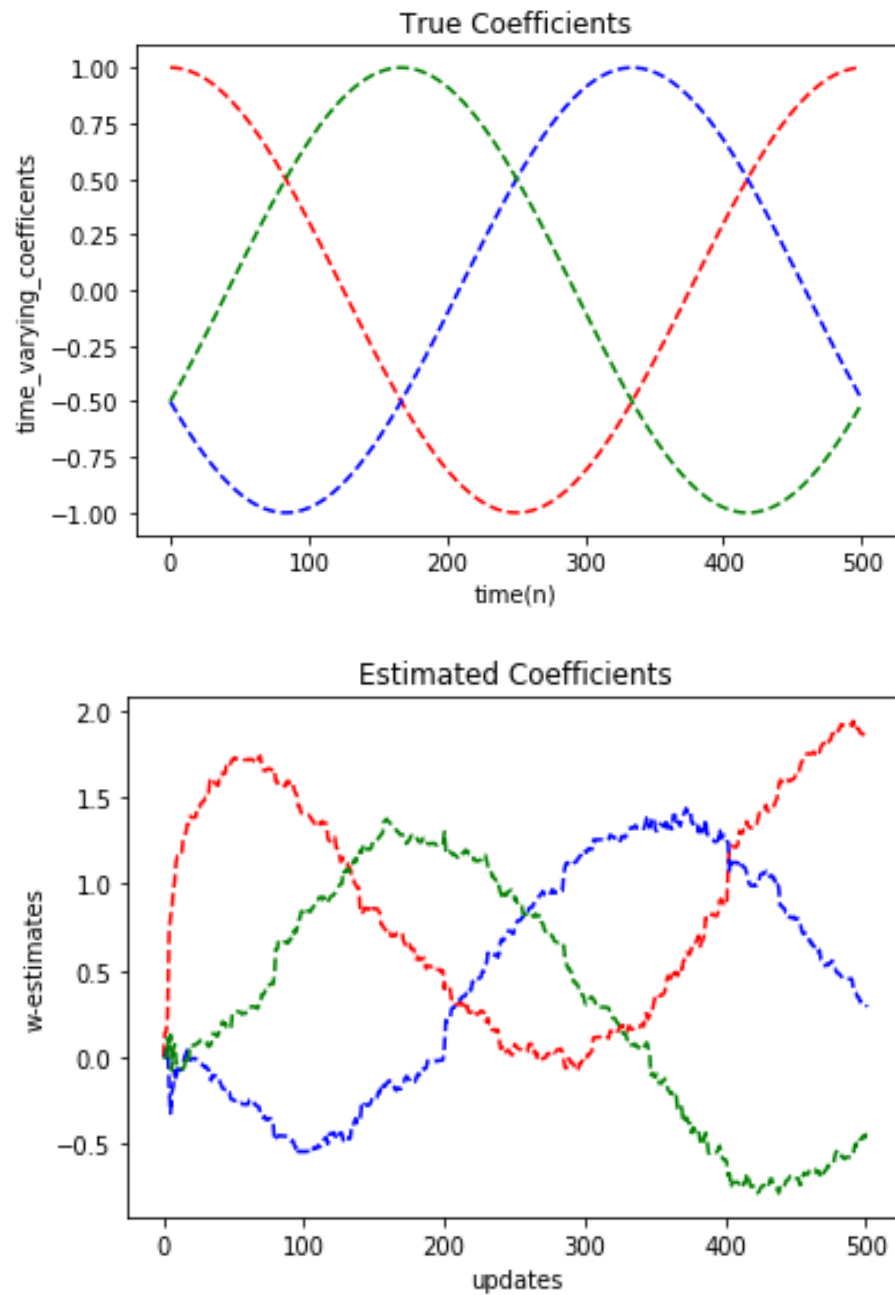
Learning Curve - eta = 0.15

3.4 (b)

Rvn : [[0.99587395 -0.00186886 0.00205905]

    [-0.00186886 0.99408593 -0.00194828]

    [0.00205905 -0.00194828 0.99201923]]

Rn : [[0.39892994 0.38404952 0.36914017]]

LLSE : 0.33275257

For me, The LLSE is lower than the LMS learning curve after convergence.